THE FOUNDRY

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Volume 53
Number 2

CLEVELAND, OHIO, JANUARY 15, 1925

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Castings Called Into Service When Nation Is Reshod

SEVENTY-thousand repair shops in the United States employing approximately 85,000 shoemakers and cobblers, are engaged in reconditioning worn boots and shoes. Repair business prospers in periods of depression, since fewer new pairs of shoes are sold and more repair work is necessary. Castings

Modern Machinery Has Not Banished the Kitchen Cobbler or the Corner Shoemaker

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Find Where Castings Can Be Sold

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Production Schedule Aids Steel Foundry Sales

From Here ? To Here

How Many Sales Are Lost Inside Your Own Shop?

By

Bert Ulehake

Commercial Steel Castings Co
Marion, Ohio

IF ANY group of castings users were asked what single factor most generally stood in the way of placing repeat orders with a jobbing foundry, what would the answer be? To put this from another viewpoint, what common failing of jobbing foundries most generally hampers the sale of castings on repeat orders? Is it not the almost universal inability to make and keep definite delivery dates on jobbing foundry work?

Meeting delivery schedules constitues one of the greatest single problems in the modern jobbing shop. This particularly is true among makers of steel castings. Practically all consumers of steel castings want definite delivery dates on their orders. If they find a foundry which will promise a job on a certain date and deliver it on that date, they seldom quibble over fractional cents in price, quality being satisfactory. Thus, ability to promise delivery and make it on schedule becomes a factor in selling castings.

As a general rule, when the foundry receives a job, the order is issued to the foundry superintendent, who in turn advises the foundry foreman. The latter is busy in his department and looks for tonnage, irrespective of deliveries. The consequence is that a casting which requires considerable work and little metal is laid aside as long as possible. The result is that the customer writes a sharp letter, or maybe a representative of the firm comes down to tell the foundryman that such a casting has to be made or he will lose the order. This makes it unpleasant for the buyer, as he may have an important contract, a partly finished machine waiting for one casting.

The company with which the writer is connected has been successful with deliveries. Some of the large users of castings compliment the foundry on delivery. These deliveries are made through an absolute production control in the coreroom and the foundry. When we started this production control, some of our old time foundrymen raised all kinds of objections. They stated that we lacked flask equipment, that it was impossible to know how long a job would require, and that under a control system which designated definite molds to be made there would not be enough molds on the floor, in which to pour the metal. It also was advanced that the system would slow production and that tonnage would drop.

When we decided on production control, a number of time studies were taken for time bases. We also took a complete inventory of flask equipment. A knowledge of these two items is essential to making deliveries on specified dates.

When a customer desires to know when he may expect delivery, the pattern is inspected. The inspector, advises whether the job is mounted or loose pattern and whether it is a floor, bench or machine job. Then the production department estimates the weight of the casting and the weight of the head and risers. When the job is put in production, it is listed on the foundry schedule, showing the date the cores are to be made and the date it is to be molded and poured, these dates being based on the available time-study data and the amount of metal previously estimated. If the mold happens to be a dry sand job, we specify the molding date and the pouring date. The cleaning room routine is specified in the same way, and the date of shipment is stated.

This system is carried on by two men who pass on between 400 and 500 tons of casting monthly, ranging between the weights of 5 and 5000 pounds. The uniformity with which our foundry operates is attributed to specific date deliveries, meeting demands which the customers believed exacting when they placed the order.

A user of large castings placed an order with us some time ago for several castings weighing over 2500 pounds. These were to be made in dry sand on a 10 day delivery and we succeeded in making complete delivery in 8 days after receipt of order, including one Sunday. We have delivered 150 small castings weighing 10 pounds each in 48 hours after receipt of order. Every casting was annealed before shipping. Both of these orders were put through the foundry without any excessive pressure or disorganization.

The foundry foremen have admitted that it makes their work easier to schedule production because they can devote more time to their men, making it unnecessary to worry about the amount of metal needed or to hunt for jobs.

After a job has been made, we can schedule it easily the next time. A set of record cards is kept, carrying all the information pertaining to the job, such as time, weight and other necessary information. These cards also are useful for our sales department, when quoting on a job.

The production department is operated along the following lines:

The production manager who is in charge, is directly responsible to the general manager and has control, not

only over the production, but also over the time study and rate-setting department.

When the system was installed a number of time studies were taken, to arrive at some time standard with regard to production. Being a jobbing foundry, we do not have continuous runs such as the specialty foundries. Therefore, often it is impossible to take a proper time study on account of the small quantities made. For this reason, we have established standards which are used in setting times and prices.

The standards are recorded on standard cards as shown at the top of page 51 These cards aid our sales department materially when quoting on similar pieces. The standard cards show the pattern equipment, the size of flasks and the yield we get from the metal poured and also the weight of metal required to produce a mold.

This information also is valuable in scheduling the work through the foundry, as the time consumed to make the part, and the amount of metal used are the two most essential items. The flask sizes shown also are important, because the flask equipment in a jobbing foundry is a big item, and the delivery of a job may depend upon having the proper flasks available.

To use the proper size flask may reduce the production time. The flask records may show that a job cannot be made at the time without discontinuing a certain job in process. In a few emergency cases this may be advisable, generally it is unwise to discontinue a job which is running to put another in the sand, as such precedure always results in lost time.

We also determine beforehand whether the job requires a molder alone or if one or more helpers are needed. It is also decided at this time whether the job is dry or green sand. We have succeeded in reducing the direct labor cost of a large casting from $44.00 to $21.75 through a persistent study of the method and time required. The same cost reductions hold good for other castings.

The customers orders are turned over to the production manager by the general manager. The production manager assigns a shop order number to every item to be made and puts this on the customers order blank. After this number has been assigned, an inspection notice is made out, numbered with the same number as the production order assigned to the item in question. This inspection notice, shown on this page, is delivered to the man in charge of the pattern storage, who is responsible to the production manager. An inspector examines the pattern to ascertain if it is satisfactory as called for on the order, and if it is complete as to core boxes, core prints, etc. The inspector has the right to reject the pattern if it is in poor condition or unsuitable to be worked economically. In case the pattern is not accepted by the inspection department, the production department is notified at once. If the pattern is passed the inspection notice is returned to the production department and the job is ready to be put on schedule.

When the inspection notice has been returned, it is turned over to the clerical department and the production order is made out as noted on this page. This order consists of four separate parts.

Pattern Inspection Order

No. B1

Date Sept 7

Please have the following Patterns inspected

CUSTOMER John Doe Co

Pattern No.	NAME	Pieces
H300A	Base	1
Weight		
Single		
Board		
Core		

INSPECTION OF A CUSTOMER'S PATTERN ON DELIVERY ASSURES AGAINST ONE CAUSE FOR DELAY IN THE FOUNDRY

CASTING RECORD

CUSTOMER John Doe Co

Pattern No. H300A (1)
Order No. B1
Ship To John Doe Co
Their Order No. X37

Date Sept 7-24
Date Received Sept 9-24
Core Date Sept 9-24
Manufacturing Date Sept 10-24
Shipping Date Sept 14-24

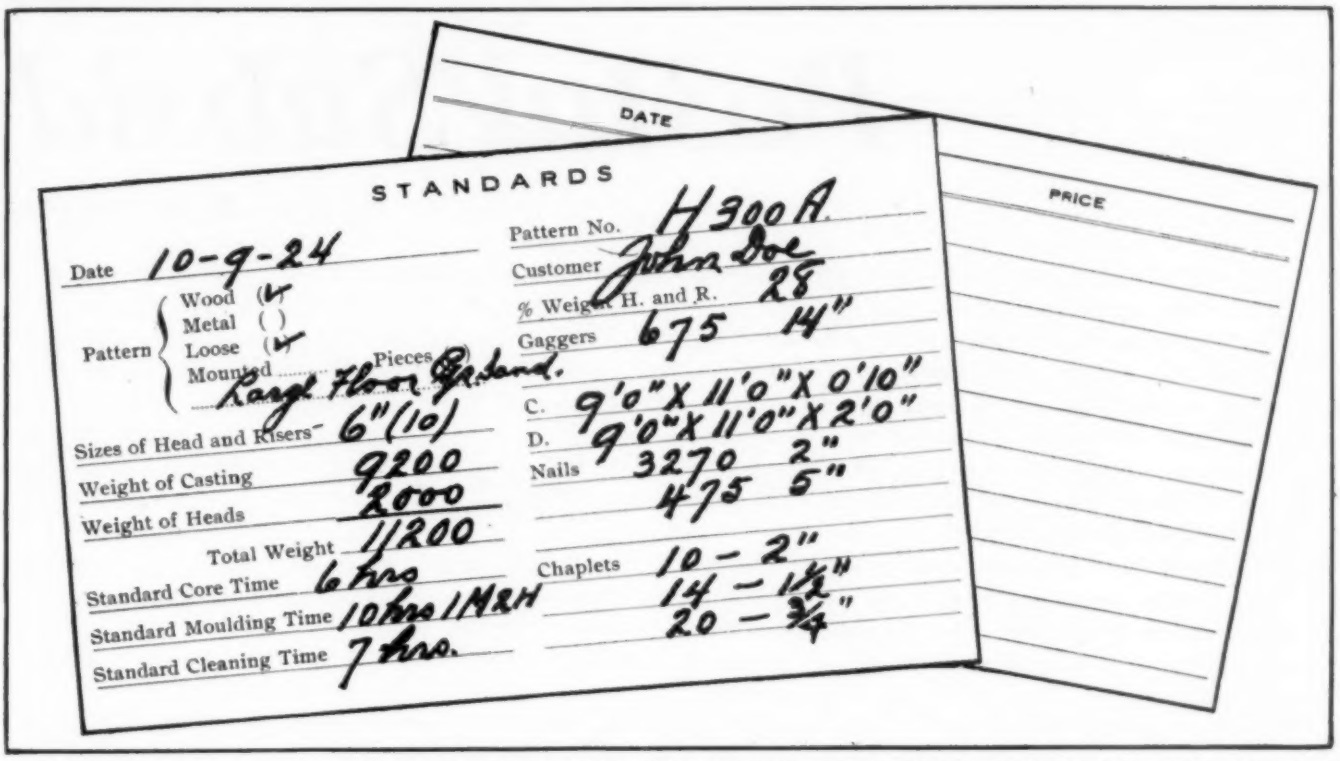
ORDER No. B1
Pattern Order
Pattern No. H300A
Flask One Size 9'0"X16"
Flask One Size 6'0"X8"
cope 0'10"
drag 2'0"
ALL CORE BOXES To Core Room
Delivery Date Sept 8
Date Sept 7

ORDER No. B1
Customer John Doe Co
Core Order
Make 1 sets of cores
Pattern No. H300A
Dry sand
Green Sand ✓
Delivery Date Sept 10
Date Sept 7

ORDER No. B1
Customer John Doe Co
Moulding Room Order
Make 1 moulds
Pattern No. H300A
Amt. of castings required 1
Dry Sand
Green Sand ✓
Date to be Cast Sept 10
Date Sept 7

CORE RODS
Pcs
3270 NAILS 2 1/2
475 5
CHAPLETS
10 2
14 1 1/2
20 3/4

A PERMANENT CASTING RECORD, BEARING COUPON ORDER FORMS FOR THE DIFFERENT DEPARTMENTS GIVES CONSTANT CONTROL AND AN OFFICE RECORD OF PROGRESS

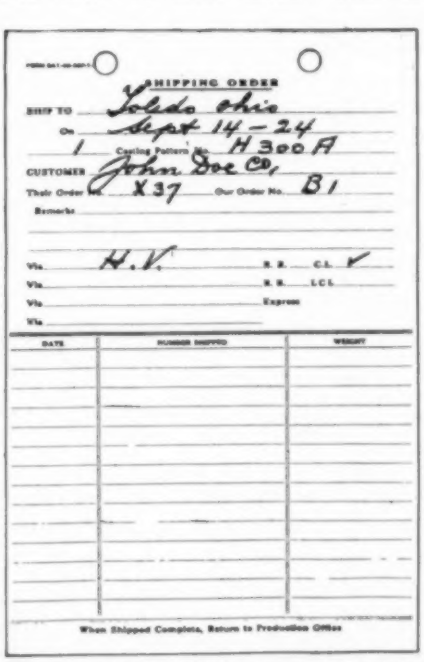


A STANDARD RECORD CARD PROVIDES PERMANENT INFORMATION ON WEIGHTS, PRODUCTION TIME AND SUPPLIES USED IN MAKING THE CASTING

The production order is provided in three different colors: white, red and green. The white card is used for regular production orders, the red card for rush orders and the green card for replacement orders, which may be caused though losses such as slag castings, misruns and outright scrap. The green cards are made up twice a day, upon the receipt of the inspection department's report on scrap. The orders bear the same number as the original order issued.

The large part of this production order, called casting record is kept in the production office for reference purposes and put in a card file. The three parts are turned over to the man in charge of the pattern storage. The first small card is the pattern order which is the pattern storage man's authority to deliver the pattern and core boxes to the foundry and corerooms. When the patterns and core boxes are delivered, the pattern order is returned to the production department and the core order and molding order are turned over to the foundry checker, who in turn places the molding order and core order on the production board under the proper date. The foundry foreman and the coreroom foreman are guided by these orders for three days' production. The foundry checker makes his rounds three or four times a day, observes the progress made, and marks up the tickets on the production board. In case any orders are lagging, he calls the foreman's attention to the jobs which are behind, so as to enable him to put forth the necessary effort to complete the job on scheduled time.

Every day the complete job cards are turned in to the production office and are posted on the production record cards, and also posted on the record cards as to the number of molds made but not cast. This enables us to inform our customers at any time should they inquire as to the status of their order. As can be seen from the production record cards, we have the scheduled dates on these cards. This enables us to check daily as to whether or not the schedule is being made. It also puts us in position to advise the customers when we expect to mold or finish the job.


SHIPPING ORDER

SHIP TO Toledo Ohio

On Sept 14-24

1 Casting Pattern No. H300A

CUSTOMER John Doe Co.

Their Order No. X37 Our Order No. B1

Remarks

Via H.V. R.R. C.L. ✓

Via R.R. L.C.L.

Via Express

Via

DATE	NUMBER SHIPPED	WEIGHT

When Shipped Complete, Return to Production Office

THE SHIPPING ORDER IS DELIVERED TO THE SHIPPING ROOM AND CLEANING DEPARTMENT

In routing the work through the coreroom and foundry, we also schedule our cleaning room and shipping room production. When the order is issued to the foundry, we issue a shipping order, reproduced on this page to the shipping department and cleaning room, which gives a specified date on which the castings have to be shipped. The shipping clerk and the cleaning room foreman have to work in close co-operation, as we hold them jointly responsible for the shipping.

Having the shipping order the cleaning room foreman knows at all times which casting should be cleaned first. The cleaning room is operated on a piece work basis, the prices being based on the weight of the casting. This has worked out satisfactorily and has made it possible for us to clean the castings as fast as we make them.

The theory was advanced when we started the production system that it would slow up production and thereby decrease the tonnage, but the first month we put it into operation, we produced more castings per labor hour than before. We met shipping promises, and made reductions in cost.

Of the 343 plants manufacturing stoves and hot air furnaces reporting to the department of commerce for 1923, 51 were located in Ohio.

Postal Subsidy

By A. O. Backert, President,

FATTENING at the subsidy trough of the post office department is the charge hurled at the publishers of the country's leading business papers and general magazines. Tremendous alleged losses incurred in handling second class mail is the basis for this charge. Whenever postal legislation is under consideration some misinformed congressman or senator raves about the thousands and millions of dollars of subsidy paid annually to the publishers. Unfortunately, in the past, these statements could not be controverted satisfactorily, actual cost figures not being available. In days gone by the post office department made many investigations of alleged costs that started nowhere and ended at the same place. About a year ago another investigation was started and the report recently was made available. Among other things it shows that second class mail caused a loss to the post office department of about $75,000,000 in 1923.

AMONG the leading publishers charged with profiting most from this alleged subsidy are the Penton Publishing Co. with its periodicals, such as THE FOUNDRY, *Iron Trade Review, Marine Review,* etc.; the United Publishers Corp., publisher of *Iron Age, Hardware Age, Dry Goods Economist,* etc.; McGraw-Hill Co. with *American Machinist, Power, Engineering News-Record* and many others; Curtis Publishing Co. with *Saturday Evening Post* and *Ladies Home Journal.* According to the figures compiled by the post office department and submitted in its cost ascertainment report, it costs the government 2.39 cents per piece for handling and transporting magazines of this class. At last here is a definite figure which the publishers can use for ascertaining the cost of mailing.

WHAT are the facts regarding the alleged subsidy enjoyed by these publishers? During 1924, 240,000 copies of THE FOUNDRY were mailed, an average of 10,000 copies per issue. However, of this total 54,000 copies were mailed to foreign countries, Canada and were sent to subscribers in the city of Cleveland. The postage on these copies was considerably higher than that paid on regular second class and the mailing charge for such delivery always has netted the post office a profit. For handling and transporting the remaining 186,000 copies of THE FOUNDRY to subscribers in the United States, the Penton Publishing Co. last year paid the post office $5,831.80. According to the figures of the government's cost ascertainment report, the expense for each piece handled and delivered was 2.39 cents. On this basis it cost the post office $4,445.40 to render this service. The profit to the government for mailing THE FOUNDRY in 1924 was $1,386.40. The figures follow:

Copies of THE FOUNDRY mailed in 1924	**240,000**
Copies of THE FOUNDRY mailed for distribution in U. S.	**186,000**
Post office cost per copy, cents	**2.39**
Post office cost for mailing THE FOUNDRY in U. S.	**$4,445.40**
Penton Publishing Co. paid postoffice for mailing THE FOUNDRY	**$5,831.80**
Profit to post office	**$1,386.40**
Or about 31 per cent profit	

SECOND class postage for mailing approximately 1,000,000 copies of THE FOUNDRY, *Iron Trade Review, Marine Review, Power Boating* and *Abrasive Industry* cost the Penton Publishing Co. $25,685.68 in 1924. On the basis of the cost ascertainment figures compiled by the government, the expense to the post office for mailing these magazines was $22,497.54. The profit netted by the post office was $3,188.14, or approximately 15 per cent. In addition a much higher rate of postage than regular second class was paid by the Penton Publishing Co. for mailing more than 100,000 copies of its publications to foreign countries.

MORE startling still are the profits paid the government by the Curtis Publishing Co. for mailing *Saturday Evening Post* and *Ladies Home Journal.* In the halls of congress the charge of the tremendous subsidy enjoyed by the Curtis Publishing Co. has been unrefuted for years. Crucifying big business regardless of the facts is a popular political avocation because it sounds good to the people "back home." Based on the government's cost ascertainment figures, the post office made a profit of $770,461 in 1924 in the mailing of *Saturday Evening Post* and *Ladies Home Journal* to their subscribers.

IF THE government is making a profit on these magazines and periodicals, then where does the loss of $75,000,000 on second class mail come from? Unfortunately the average reader visualizes second class mail only by his newspaper, by his magazine or by his business paper. He knows nothing about the other printed matter so classified. It does not occur to him that the 4-page meeting notice of his fraternal organization, labor union, technical society, or other association with which he may be affiliated is masquerading under the guise of a bulletin or a publication entered

Lie Is Nailed

The Penton Publishing Co., Cleveland

as second class. He does not know that newspapers and periodicals including bulletins, etc., maintained by and in the interest of religious, educational, scientific, philanthropic, agricultural, labor or fraternal organizations or associations, also are entered as second class mail. Furthermore, this printed matter is handled at a much lower rate than that charged the business papers. On the advertising contents of the latter publications, the second class rate varies from 2 to 10 cents per pound, depending upon the zone. Contrast this with 1¼ cents paid on the other matter mentioned.

ONE weekly bulletin of a technical society received the other day, which has no other value than to announce the date of the next meeting, is entered at the Cleveland post office as second class matter. It consists of four pages and 55 of these notices weigh one pound. The post office receives, sorts and delivers one pound of these bulletins to 55 different addresses at a charge of 1¼ cents. It is known that 1200 of these bulletins are mailed weekly. These weigh about 22 pounds. For rendering this service, the post office receives 27.5 cents per week. According to the government's cost ascertainment report the expense involved in the delivery of each piece of second class mail handled is 2.39 cents. It actually costs the post office department to deliver these bulletins, $28.68 weekly, or more than 100 times the postage paid. The loss on each issue is $28.405. The loss on 52 issues of this one bulletin amounts to $1,477.06.

NOR is the foregoing an exceptional case. Some of these bulletins average only 100 to the pound for the delivery of which the postoffice charges only 1¼ cents. Now try to visualize the thousands and thousands of labor, religious, philanthropic, educational, and other organizations throughout the country that avail themselves of this privilege. Think of the billions and billions of pieces of mail thus handled by the postoffice at the ridiculous charge of 1¼ cents a pound. This is a source of loss to the postoffice of millions and millions of dollars and constitutes a large part of the $75,000,000 loss.

BUT that isn't all. Newspapers are delivered without charge in the county in which they are published. The post office department received, sorted and delivered 65,393,277 pounds of these newspapers in 1923 without one cent of revenue. This free service entailed a loss of from $6,000,000 to $20,000,000 to the post office, depending on how it is estimated. And this loss is charged against second class mail.

THE publishers of business papers and magazines who already are paying a profit to the post office for service rendered, again are confronted with another advance in rates. The fact that their second class rate was tripled and quadrupled as a war measure and never was restored to a pre-war basis, does not enter into consideration. The government must have $68,000,000 more revenue if the postal employes are to receive their wage increase. Second class mail and only that part of it that is already more than paying its way is asked to assume about $10,000,000 of this added burden. The newspapers are to retain their free-in-county privilege. Labor, educational, religious and other organizations are going to be permitted to continue to mail bulletins weighing from 55 to 100 per pound at a charge of 1¼ cents a pound. Other subsidies are to be retained, but the publishers are called upon *to pay still more*.

IT IS high time that congress decides whether the post office is to be conducted as a service to the people or whether it is to be operated as a self-sustaining business enterprise. If it is to be considered a service to the people, then proper appropriations must be made by congress to provide against deficits incurred in the delivery of mail to remote rural sections of the country. It must provide appropriations for defraying the losses on free and nominal charge second class service. The constitution provides that the government shall establish and maintain post offices and postal routes. This service is analagous to that rendered shipping by the establishment of lighthouses and coast guards, hatcheries for the fishermen, reforestration, dredging of harbors, damming of rivers, etc. If on the other hand, the post office is to be conducted as a self-sustaining business enterprise, free service now rendered will have to pay its way. Parcel post, which is not a post office activity, will have to yield millions of additional income. Rural free delivery will become prohibitive and star routes will not be established so freely.

PUBLISHERS of business papers and magazines are asking only for a square deal. The political smoke screen of alleged losses incurred in handling their publications has been penetrated. The mask enabling this penetration was furnished by the cost ascertainment report of the postoffice department itself. Arraigned for years under the severe indictment of government subsidy, the post office department merits the thanks of the publishers for providing the argument that has effected their acquittal.

Boys Compete for A.F.A. Prize

Many Features in Connection with the Contest Indicate That While Basic Principles of the Trade Remain the Same, Details of Molding Practice Have Changed

ONE of the interesting features in connection with the recent convention and exhibition of the American Foundrymen's association in Milwaukee, was the contest staged in the foundry of the Milwaukee Vocational school between several boys selected from the first, second and third year apprentices at the foundry of the Allis-Chalmers Co., West Allis, Wis. This demonstrated forcibly that while the basic principles remain the same, methods of teaching have changed to some extent to meet changing conditions in the industry. Items in the apprentices course of education that once were deemed of paramount importance, now are relegated to second place or omitted altogether in the vocational schools today.

Under the old dispensation, an experienced foundryman could appraise a new man to a reasonably accurate extent by the manner in which he started a job. Inside of an hour on the morning of the first day he had the man cataloged in his mind as poor, fair or good and only rarely did he have to revise his opinion as a result of later and further observation. He based his opinion primarily on the manner in which the molder handled his shovel in cutting over the sand pile. Precision, speed and skill in handling this humble instrument was regarded as a cardinal principle in the education of an apprentice molder. In fact he was constantly reminded of its importance both by the foreman and by his fellow workmen. Emulation, that peculiar mental attribute which causes boys and other people to attempt any feat attempted by others, an attribute that resents an implication of inferiority or lack of skill, caused the average boy readily to acquire the necessary technique involved in flirting the sand off the end of the shovel to attain the proper aerating effect. He learned how to attain maximum speed with minimum effort, to produce a heap of sand level on the top smooth and uniform and with an even slant on each side. He also learned how to stand on either side of the heap so that he might rest without stopping, by shoveling alternately from the right

Fig. 1—Below—Third year boys class showed a degree of skill equal to that of the average molder working on the side floor

Fig. 2—Above—While there was little to choose between the molds made by the second year boys the T pipe made by the boy to the extreme right was the most satisfactory

and from the left side. The apprentice might never develop skill with both hands in the use of a trowel or a slicker, but he had to become ambidextrous with the shovel.

The shovel had to be kept smooth and clean at all times and usually was anointed with an oily rag before it was hung up for the night. A piece of a soldier or a wood wedge, sometimes the blade of a trowel, was employed several times a day to remove any film of sand that persisted in sticking to the inside of the blade near the lower edge. In addition to the natural craftsman's pride which induced the molder to keep his shovel as clean as any of the other tools, he was influenced by the knowledge that considerably less muscular effort is required to manipulate a clean shovel than one which is crusted with hard sand.

Bearing the foregoing factors in mind the foreman was justified in assuming that a man who was slovenly or awkward in the use of a shovel would prove equally unsatisfactory in performing the other duties that fall within the legitimate scope of the man who sets himself up as a journeyman molder.

Owing to changing conditions and the extensive use of mechanical sand cutting, sand handling and conveying equipment especially in the larger foundries, the shovel is losing its place as a member of the molder's tool kit. The sand is prepared on the floor ready for the molders use, or it is delivered to him by truck or grab bucket as he needs it. Sometimes the grab bucket dumps the sand directly into the flask and under other conditions the flask is filled through a spout connected to a storage hopper. Under any of the foregoing conditions the molder only uses the shovel intermittently and as a result he develops neither speed, ease or neatness either in its care or manipulation.

The three experienced foundrymen selected to pass upon the qualifications of the nine apprentices taking part in the contest at the vocational school had to make allowance for this and other features in making the awards of prizes.

By setting up a number of theoretical standards and by ascribing a definite value to each of these standards, the value of each boy's work might have been figured on a percentage basis and the awards made accordingly. However, so many variable factors were presented in this instance that the judges decided to rate the boys by results rather than by the methods by which these results were achieved. In other words, they rated them as first second and third in the same manner they would have classed them as first second and third if the boys had been working in shops which they controlled. The difference between the work of the three boys in each class considered on this basis was so slight that under actual working conditions they would have been entitled to the same hourly rate. In fact so little difference was apparent in the work of the three boys in the first year class that a recommendation was made to split the amount of the award and divide it among them in three equal portions.

While the element of time entered to some extent, it was not an important and by no means a deciding factor. Each boy was given a pattern different from the others and thus, while the actual time consumed in making the mold presented a point of interest, it was of no value relatively in any attempt to compare the working speed of one boy with that of his competitors. The boys in the first class were given plain flanges in which the entire pattern was placed in the drag. The second year boys worked from split patterns with one half in the drag and the other half in the cope of the flask. The third year boys were given patterns that involved the use of three-part flasks and that called for practically the same degree of skill as that possessed by the average jobbing molder accustomed to small and medium weight castings.

In a preliminary consultation before the molds were closed, the judges were inclined to favor the boy in the second year class, shown at the left in Fig. 2, for having the neatest appearing mold. The gaggers left no impression on the joint as they did in the remaining two molds. However, the cause was apparent when the castings were examined. The boy on the left did not ram his sand hard enough and as a result the hub of the casting extending into the drag was swelled slightly out of shape. The boy in the center consistently rammed his sand hard with the result that the sand in the corners of the green sand pocket was scabbed. The small **T**-pipe made by the boy to the right presented a pleasing appearance without either fins, scabs or swells and on this final show down the boy who made it was awarded the prize.

This same feature, a practically perfect casting was the deciding factor in awarding the prize for the third year class to the boy shown in the center of Fig. 1. He made a casting for a worm gear from a pattern split through the center in a three part flask that was rolled over twice. The boy to the right (who is not shown in the illustration) and the boy to the left made an exceedingly creditable showing on their respective jobs, a brakeband wheel in which the center part of the mold had to be lifted in addition to the cope and a double flange reducer nozzle on which the mold had to be rolled twice.

The names of the prize winners and other data were given on page 838 of the Nov. 1 issue.

Fig. 3—The work of the boys in the first year class did not show variation that would justify selecting one in preference to the others

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The department of commerce announces that according to the data collected at the biennial census of manufacturers, 1923, the plants engaged primarily in the manufacture of textile machinery and parts reported products valued at $140,661,358, an increase of 9.1 per cent as compared with 1921, the last preceding census year. This classification covers all classes of textile machinery, including machinery for bleaching, dyeing printing mercerizing, finishing, etc.

Builds Coast Malleable Plant

Many Changes from Customary Practice Adopted in New Castings Plant Recently Completed in California—All Departments Housed in One Building—Practically All Handling Is Done with Crane and Magnet

DESIGNED from the standpoint of progressive manufacturing and elimination of as much of the high cost of handling materials as possible, the new plant of the Pacific Malleable Castings Co., now in operation at Oakland, Cal., is the last word in malleable foundry construction. The usual practice of building malleable plants with the foundry and core room in one building and the cleaning and annealing departments in a separate building has been done away with in this new plant. Not only are all departments housed in one building but they are located one to the other in the sequence of operations, thus eliminating any back tracking of work in process. Another departure from ordinary practice is that all iron is transported from one department to another by means of a 5-ton electric traveling crane using an electric magnet. The building is light and airy, with plenty of ventilation to permit the gases to disappear rapidly after pouring, thus removing a source of discomfort.

Starting in a new territory with plenty of ground and ideal climatic conditions for foundry work, the new plant was designed to embody all of the good features possible as gained by others from long experience in foundry practice. The fact that Oakland has an average temperature the year around of about 55 degrees Fahr. made it possible to construct a sheet metal covered building without requiring an expensive heating installation.

The plant is 160 feet wide and 360 feet long and has three bays. The two side bays are 50 feet wide and the center bay 60 feet wide. On the two sides, the distance from the floor to the bottom chord of the roof truss is 15 feet and in the center bay 29 feet. As shown in Fig. 1, this high center bay permits the installation of the electric crane and also allows the gases to rise to the monitor and disappear quickly. The crane runway runs outside the building for a distance of 100 feet, permitting the crane to run out over the railroad track for unloading purposes and for covering the metal storage yard. In order to utilize the space on either side of the crane runway and for economy in construction, the back legs supporting the crane runway columns have been used to carry the roof of the sand storage sheds.

A sidetrack off the Southern Pacific railroad runs parallel with and along the full length of one side the building. A spur off this sidetrack cuts through the crane runway and sand storage sheds to facilitate using the electric crane for unloading both metal and sand. Provision has been made so that later the sand may be unloaded by means of a belt conveyor and dropped into the proper bin without requiring any labor except for cleaning out the corners of the railroad cars.

The electric crane is of 60-foot span and 5-ton capacity and was manufactured by the Milwaukee Electric Crane & Mfg. Co., Milwaukee. It is equipped with a 45-inch electromagnet. Both the crane and the magnet operate on 250-volt direct current. The ease with which the magnet may be connected or disconnected from the crane is a feature in making this crane flexible for all work to be done.

Handling of metal from the cars to storage in the crane runway, from storage to the platform scales for making up the proper charge and from the scales to the furnace is done by the crane. All charging is done with the crane and magnet, no skips or buckets being required. The fact that the entire furnace charge is made up and charged with only the aid of one man in addition to the crane operator gives some idea of the work which the crane can do.

The crane also handles the bungs on and off the furnace, the slag bucket and takes molten metal away from the furnace. After the castings have been dumped, the same magnet handles them to the elevated platform back of the tumbling mills. As shown in Fig. 3, the magnet can be disconnected and the crane utilized for dumping the annealed

FIG. 1—A VIEW DOWN THE MAIN BAY OF THE BUILDING— DEPARTMENTS ARE SO LOCATED THAT WORK CAN BE HANDLED FROM ONE TO THE OTHER BY USE OF A 5-TON ELECTRIC CRANE AND ELECTROMAGNET

castings from the annealing pots after which the magnet again is put on the crane and is used to separate the castings from the packing. After this is accomplished, the castings are transported to the soft iron mills and sand blast barrels for finishing. The annealing pots then are stacked by the crane.

As the company makes its own annealing pots, the crane and magnet are used to lift the pots out of the pits after they are cast and to leave them suspended while the sand is cleaned out.

These are but a few of the many uses to which the crane is subjected but it can be seen that a considerable saving in man power results in every department.

The coreroom, shown in Fig. 2, is situated in one corner of the foundry and has windows on two sides. The other two sides are open to the foundry allowing full light to come in. The benches are lined up against the wall and have the core sand bins at the back of each. The benches are of hardwood frame and top and have sufficient bin storage capacity to take care of the coremakers' sand requirements for a day's work without replenishing This allows the benches to be stocked at night so the coremakers can start working the next morning and continue all day without interference or waiting for sand.

All core sand is mixed in a mixer manufactured by the National Engineering Co., Chicago. It has been found that core sands mixed mechanically show greater strength, use less oil and work equally satisfactorily in the foundry as compared with sands mixed in any other way. Equipped with a side loader, this machine is efficient and not only mixes all the core sand but prepares the facing and molding sands for the foundry.

FIG. 3—CASTINGS ARE CARRIED TO THE TUMBLING MILLS BY THE MAGNET WHICH PLACES THEM ON THE ELEVATED PLATFORM OR DIRECTLY ON THE MILLS

FIG. 2—CORES ARE PLACED IN ONE SIDE OF THE OVEN, TAKEN FROM THE OTHER AND STORED ON RACKS

The other equipment in the core room consists of one 6 x 20-foot fuel-oil fired core oven, shown in Fig. 2. With doors on both sides of the oven, the cores can be put in on one side and taken out, after baking, on the opposite side and placed in storage for cooling. The storage is arranged in a similar manner so that the cores are taken out of the racks progressively and thereby the oldest cores are taken first.

A hood over the oven takes the fumes out of the room quickly so the coremakers are always working in good air. An automatic recording instrument maintains the proper temperature in the oven. A rosin mill, core wire cutter, gyratory sand riddle and rollover molding machine also are included in the coreroom equipment. All cores are delivered to the molders' floors on a core truck.

The malleable furnace is located at nearly the center of the molding floor

FIG. 4—FOLLOWING ANNEALING THE POTS ARE EMPTIED BY A CRANE

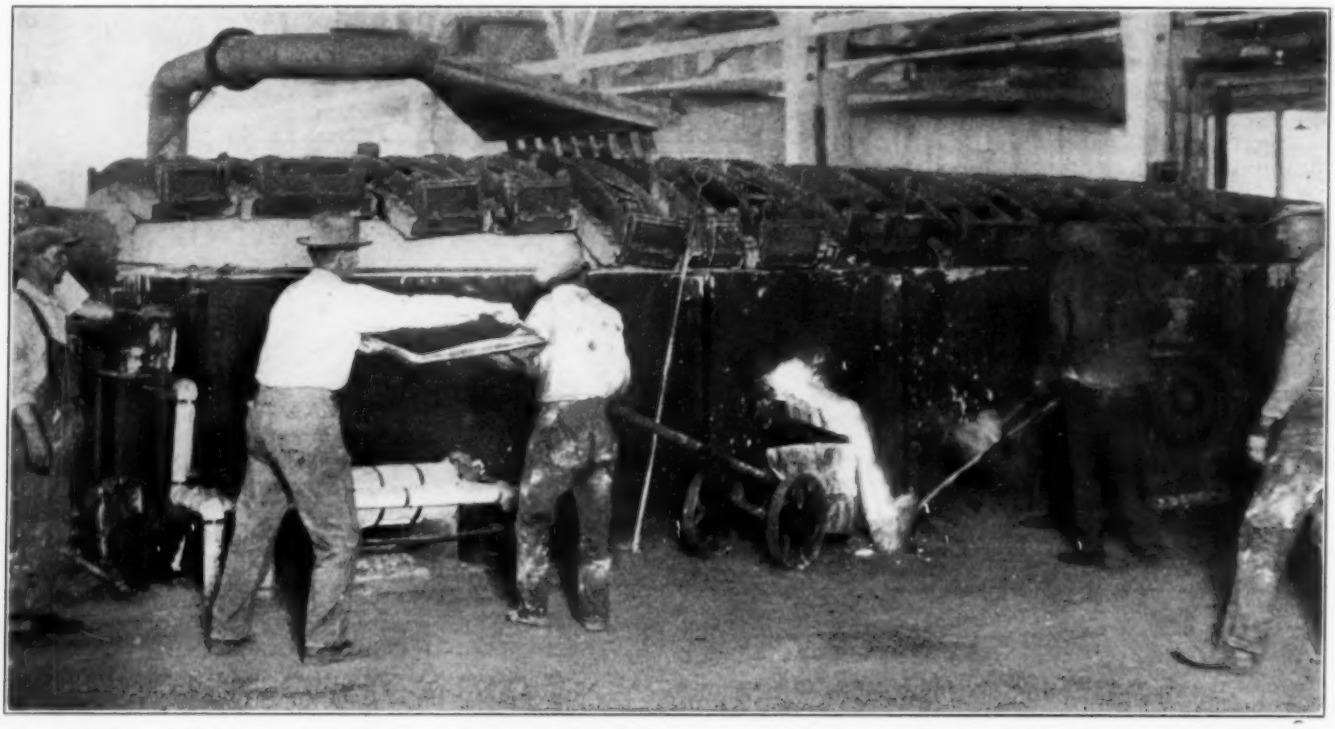


FIG. 5—THE MALLEABLE FURNACE IS OF THE REVERBERATORY TYPE AND OF 20 TONS CAPACITY—OIL IS USED FOR FUEL—SLAG FROM THE FURNACE IS USED TO PACK THE ANNEALING POTS

space and has sufficient room around it for 50 molders. The floors are each 10 feet wide and 40 feet long. The floors along the sides of the building all terminate at a 10-foot concrete runway which extends along both sides of the building, to facilitate easy access when carrying metal from the furnace to the floors, getting castings away from the molders' floors, delivering sand and cores to the molders, etc. All of the balance of the floor space is covered with clay.

Practically all floors are equipped with either movable molders' benches that straddle the sand pile or squeezers that can be moved alongside the sand pile. This is shown in Fig. 7. This makes it easy for the molders to place their molds on the floor without having to carry them any great distance. Every bench is equipped with compressed air for operating vibrators and blowing off patterns. Snap flask equipment has been provided throughout except on a few special jobs where steel flasks are being used in connection with machine molding.

The melting furnace, which is shown in Fig. 5 is of 20 tons capacity and of the reverberatory type commonly employed in malleable practice. It is oil fired, compressed air being used for atomizing the oil and low pressure air

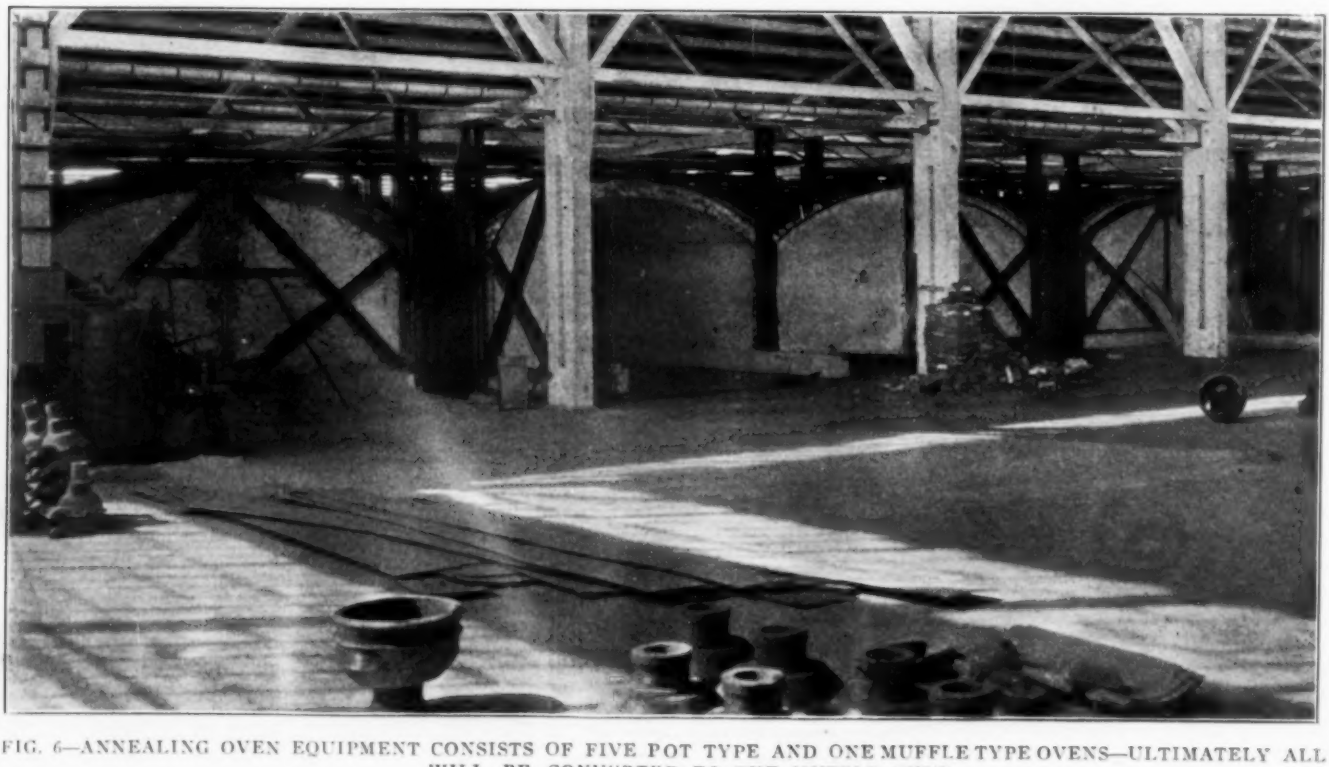


FIG. 6—ANNEALING OVEN EQUIPMENT CONSISTS OF FIVE POT TYPE AND ONE MUFFLE TYPE OVENS—ULTIMATELY ALL WILL BE CONVERTED TO THE MUFFLE TYPE

at about 4-ounce pressure for combustion. The air is admitted around the burner and also through the wind bung. Careful regulation of both the air and oil is maintained by preheating the oil to correct temperature and using reducing valves for maintaining exact pressures. In addition, a meter is used on the oil and blast meters on the low pressure air for regulation of the proper amount of oil and air to give complete combustion without excess of either. The gases, after combustion in the furnace, go out through a 6 x 60-foot brick lined, self supporting steel smoke stack.

Slag is drawn off the bath into running water and dropped into a perforated slag bucket of 1 cubic yard capacity. The water for this purpose is circulated through a single stage pump of 100 gallons per minute capacity, discharging in the upper end of the trough through a 2½-inch pipe. The water granulates the slag, separating the iron and slag so completely that by passing the magnet over this slag the iron shot is removed easily. The slag is then shot for packing castings in the annealing pots and the chilled shot is used in the sand blast barrels or for remelting in the furnace. As already stated, the furnace is charged by means of the overhead crane and magnet.

The castings are all shaken out on the molding floor and piled under the crane runway. Here the gates and sprues are knocked off the castings and piled separately, after which they are carried to the outside of the building by the crane. With the magnet the castings are then carried to the elevated platform over the hard iron mills, or they may be dumped directly into the mills. This operation is shown in Fig. 2. After thorough cleaning, the castings are dumped down an incline on to a chipping table extending the full length of the mills. This table is just the right height for men to work on the castings. The annealing pots are directly back of the chippers so that as fast as the castings are ready for packing, they may be put in the pots. When sufficient pots have been packed to fill an oven, the charge is put in the oven by means of a steam charger fired with fuel oil and built by the American Foundry Equipment Co., New York.

Present annealing oven equipment, some of which is shown in Fig. 6, consists of five pot type ovens 15 x 30 feet inside, and one muffle oven 12 x 25 feet inside the muffle. All ovens are built with checkerwork below the floor and are 6 feet longer than the oven above in order that the pot type ovens may be converted into muffle ovens at a later date. One of the features is the method of closing the ovens after they are charged. Refractory concrete swinging doors close the whole front of the ovens except about 8 inches at the bottom. Because of the necessity for using a structural steel frame to hold the concrete, it was decided to make a removable refractory block to fill the space from the floor of the oven to the bottom of the door and provide a recess in this block into which the steel frame would fit so the door frame is entirely insulated from the heat. Two men can easily place the blocks in position. These doors are hung on ball bearings and have reduced to a minimum the labor required to close or open an oven.

The fire-pot type ovens are all oil fired from the back end, and the muffle oven is oil fired from both ends. An oil meter is used at each burner for proper control of fuel. Air at 1½ pounds pressure for atomizing and combustion is furnished by a 15-inch centrifugal air compressor. The checkerwork and flues all lead to a brick-lined steel stack 5 feet inside diameter and 60 feet high. Temperature control is by means of two point dot-dash recording potentiometers which record the temperature from two points at each end of each oven. In this way almost perfect regulation of annealing temperatures is maintained. This system has been so installed that temperatures from 16 points in the same oven can be recorded, if so desired.

From the annealing department the castings are delivered in front of the soft iron mills. These, together with the hard iron mills and sandblast equipment, were installed by the Rockford Malleable Iron Works, Rockford, Ill. The fact that these mills all are equipped with trunnions running on self-aligning roller bearings in oil tight bearing boxes gives them long life.

Provision has been made for later

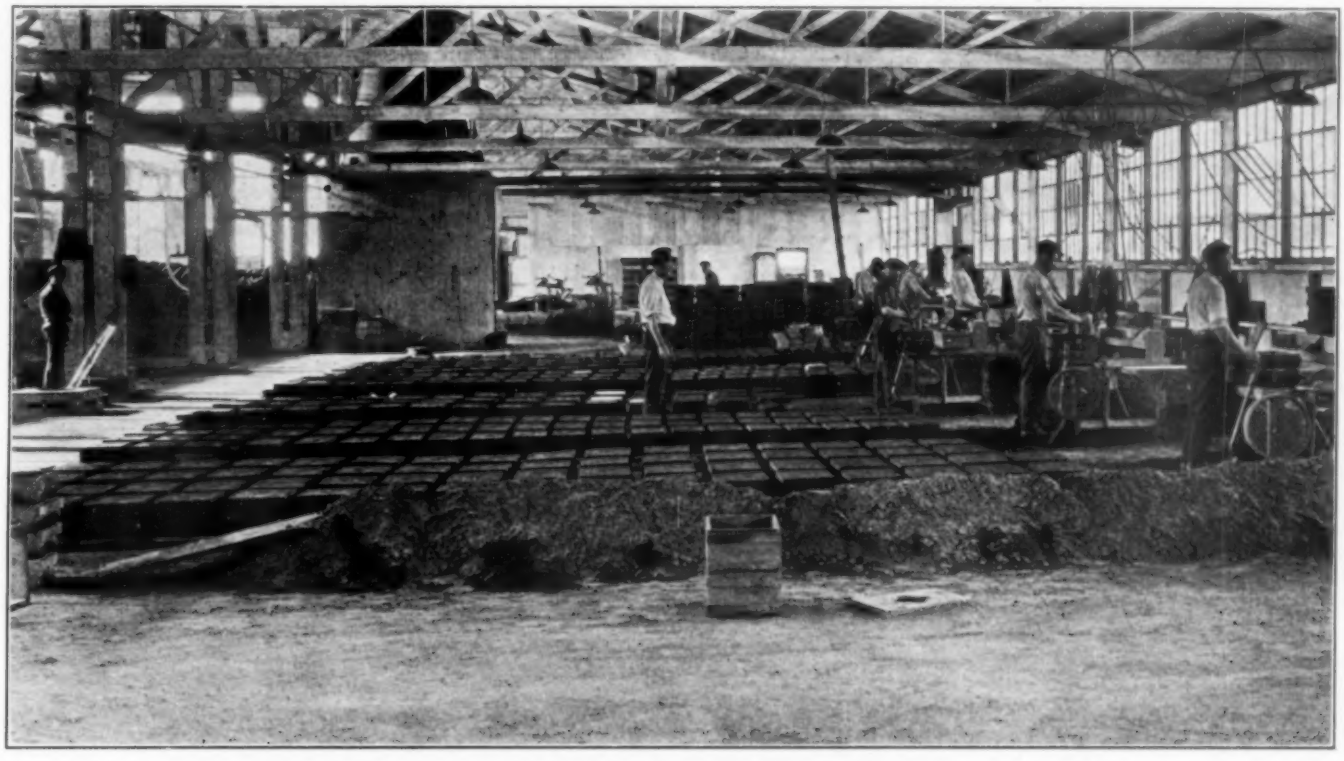


FIG. 7—A PORTION OF THE MOLDING FLOOR. EACH BENCH IS SUPPLIED WITH MOVABLE MOLDERS BENCHES OR PORTABLE SQUEEZERS—THIS CONSIDERABLY REDUCES MOLD CARRYING

elevating the soft iron mills to conform with the hard iron mills, but this has been postponed until the annealing ovens have been converted to the muffle type, as the method of handling the castings will be somewhat different then than at present.

From the mills and sandblast, the castings pass to the grinding department which is equipped with two two-wheel ballbearing stands furnished by the Safety Emery Wheel Co., Springfield, O. A feature of the dust collecting system used in connection with all mills, sand blast barrels and the emery wheel stands is a dust trap in the pipe line just before it enters the fan. This dust trap is equipped with steel plate liners to take the wear from the fan and blades.

A fan driven by a 40-horsepower motor creates the suction, keeping the mills and air in the cleaning room pure for the workmen. The discharge of the fan is through another dust collector located outside the building for trapping the balance of the dust that may come through the dust trap. Experience has shown that about 65 per cent of the dust is settled out in the trap and the balance in the dust collector.

A rope drop hammer has been provided for straightening such castings as may require it after annealing. Castings completed are then sacked and weighed for shipment by rail, or local shipment by truck as may be required.

An air compressor of 880 cubic feet capacity driven by a 165-horsepower synchronous motor furnishes the high pressure air throughout the shop for operating all air operated machines. A 37½ kilowatt motor generator set supplies 250-volt direct current for operating the crane. All fuel oil is pumped by means of rotary pumps, one being used for unloading the fuel oil from the cars and pumping it into the two 10,000-gallon storage tanks and another for supplying all burners. A fuel-oil fired, 25-horsepower locomotive type boiler is used for heating the oil and supplying such steam as is required for other purposes around the plant. Water for foundry use is secured from a well 250 feet deep equipped with a 14 stage deep well centrifugal pump.

The plant also has one of the most complete and modern laboratories on the Pacific coast for maintaining high quality malleable castings. Besides the usual equipment for determining the chemical analysis, a photographic microscope has been installed to study the structure of the metal as well. A well equipped pattern shop and repair shop round out the plant so that it is a complete unit by itself and is equipped to handle the largest or the smallest malleable castings complete from the making of the patterns to the shipping of the finished castings.

The plant has been designed, constructed and is now being operated by the Rockford Malleable Iron Works, Rockford, Ill. The company is owned jointly by the Rockford Malleable Iron Works, and the Best Steel Casting Co., Oakland, Cal. The personnel of the company includes H. H. Whiting, president, and A. J. Brandt, general manager. The directors are W. A. Forbes, G. O. Forbes, and F. C. Rutz, respectively president, treasurer and vice president of the Rockford Malleable Iron Works and H. H. Whiting, John Touhy and G. A. Gunn, respectively president, vice president and sales manager, of the Best Steel Castings Co., with A. J. Brandt of the Rockford Malleable Iron Works and general manager of the Pacific Malleable Castings Co.

Pump Cylinders Are Dirty When Bored Out

Question—I will appreciate any information you can give me on the correct method of molding small hand pump cylinders. These castings vary in length from 10 to 18 inches and in diameter from 3 to 6 inches. They are plain castings, machined throughout their entire length on the inside and on a reinforcing band on each end on the outside. Dirty spots and small holes appear in many castings after the boring tool has passed through and we are wondering if it will be necessary to cast them on end. We now have the patterns mounted in pairs on match plates and pour the molds horizontally.

Answer—Your method of molding conforms to the best recognized practice and is not responsible for the defective castings. Your letter is not sufficiently definite on which to base a positive opinion. The condition to which you refer may be due to any one or any combination of three possible and probable causes. Taking them in their order of relative importance they may be set down as: (1) Hard cores; (2) hard molds; (3) oxidized iron.

The cores for these castings should be made from a free venting sand bonded with a minimum amount of binder and thoroughly dried. They should be provided with a free and unobstructed vent from end to end and in the event that the ends of the cores do not project through the ends of the flask an opening should be provided through which the gas can escape freely. A hard core, that is one in which too much binder has been employed, will cause the iron to *boil* when it comes into contact with it. The boiling action loosens the blacking and small quantities of sand from the surface of the core and causes the dirty spots uncovered by the boring tool. Some of the gas escapes through the metal and then through the riser or through the body of green sand forming the outside of the mold. Some of it is trapped by the rapidly solidifying metal in the comparatively thin casting and remains in the form of small gas pockets. We suggest that you subject a few cores selected at random to the following test. Prepare an open sand mold approximately the same diameter as one of your cylinders and place one of the cores upright in it. Then pour the mold full of iron and watch it carefully as it rises. If the iron shows the slightest indication of fluttering it is apparent that the core is not fit to go to the mold. A core that is damp will cause the iron to boil as violently as a core that is hard.

The sand in the mold may be damp or may be rammed too hard. Either of these conditions will cause the iron to flutter away from the surface carrying with it small particles of sand or blacking and the result will be the same as that described in the preceding paragraph. The remedy for either of these troubles is obvious.

The third possible cause of the defective castings is oxidized iron. This is the result of a low bed or a high blast or both. Where the layer of coke above the tuyers is not sufficient in quantity to absorb all the oxygen from the air as it passes through, the excess units with the iron and the resulting metal is similar to that in a bessemer converter in the first few minutes of the process.

The location of the dirty area and the character of the small holes usually indicates the cause. For example if the gas pockets are clean and colored and if in addition they are scattered all through the casting, it is evident that the iron was oxidized in melting. Steam from a damp mold or core will produce small cavities smooth but colorless. Where the core or the mold is hard so that the escaping gas disrupts the surface the particles of sand will collect in a body and attach themselves to the first solid body with which they come in contact. In your case that would mean the under side of the core. In the event that the disturbance is sufficiently violent or prolonged patches of dirt might float further.

Makes Heavy Steel Castings

Molding, Melting and Handling Equipment Is Provided for Producing the Exceptionally Large Castings Used in the Railroad Industry and in the Generation of Electric Power

BY PAT DWYER

INCREASING utilization in recent years of the potential power going to waste for centuries in Canadian rivers has led to the installation of equipment for converting the force exerted by the water into electric energy that may be applied locally or may be distributed over a wide territory. Some of these pieces of equipment present no unusual features either from a manufacturing or operating standpoint, while others are among the largest ever constructed and present the most modern ideas and practice in hydro-electric development. The manner in which various branches of industry travel hand in hand is illustrated by the fact that practically all the castings entering into these installations have been molded, machined and assembled in Canadian manufacturing plants. Some of these plants have been in existence for many years and have been adapted and improved to keep step with the times. Others have been erected in recent years and are particularly well designed and equipped to meet present day requirements.

Dominion Foundries & Steel Co., Hamilton, Ont., a comparatively new plant does not operate a machine or assembling shop, but with a battery of two electric and five open-hearth furnaces, it is one of the leading producers of steel castings in the Dominion of Canada. Approximately half of the steel melted is poured into locomotive and railroad car castings. The remainder is devoted to general jobbing work including large castings for power plant installations typified in the casting shown in Fig. 1 which required all the steel melted in simultaneous heats in two 35-ton furnaces and which weighed 45 tons after it had been chipped and cleaned. This casting is a rotor for an electric generator designed to be driven by water power and is one of many furnished by the Hamilton foundry during the past year.

By referring to the drawing reproduced in Fig. 2 it may be noted that the various buildings united under one roof and comprising the foundry proper occupy an area approximately 400 x 700 feet. Other individual and auxiliary buildings shown to the lower left in the same illustration and designed for various purposes as the captions indicate, occupy additional space to the extent of 300 x 500 feet. The plant is served by spurs from the main line of the Canadian National railways whose right of way and tracks adjoin the foundry property along one side. Industrial tracks connecting the various departments of the plant facilitate the transfer of material from one point to another and relieve the cranes of a great deal of routine lifting.

By referring to the illustration, Fig. 2, the reader may note that the flow of material is constantly upward, com-

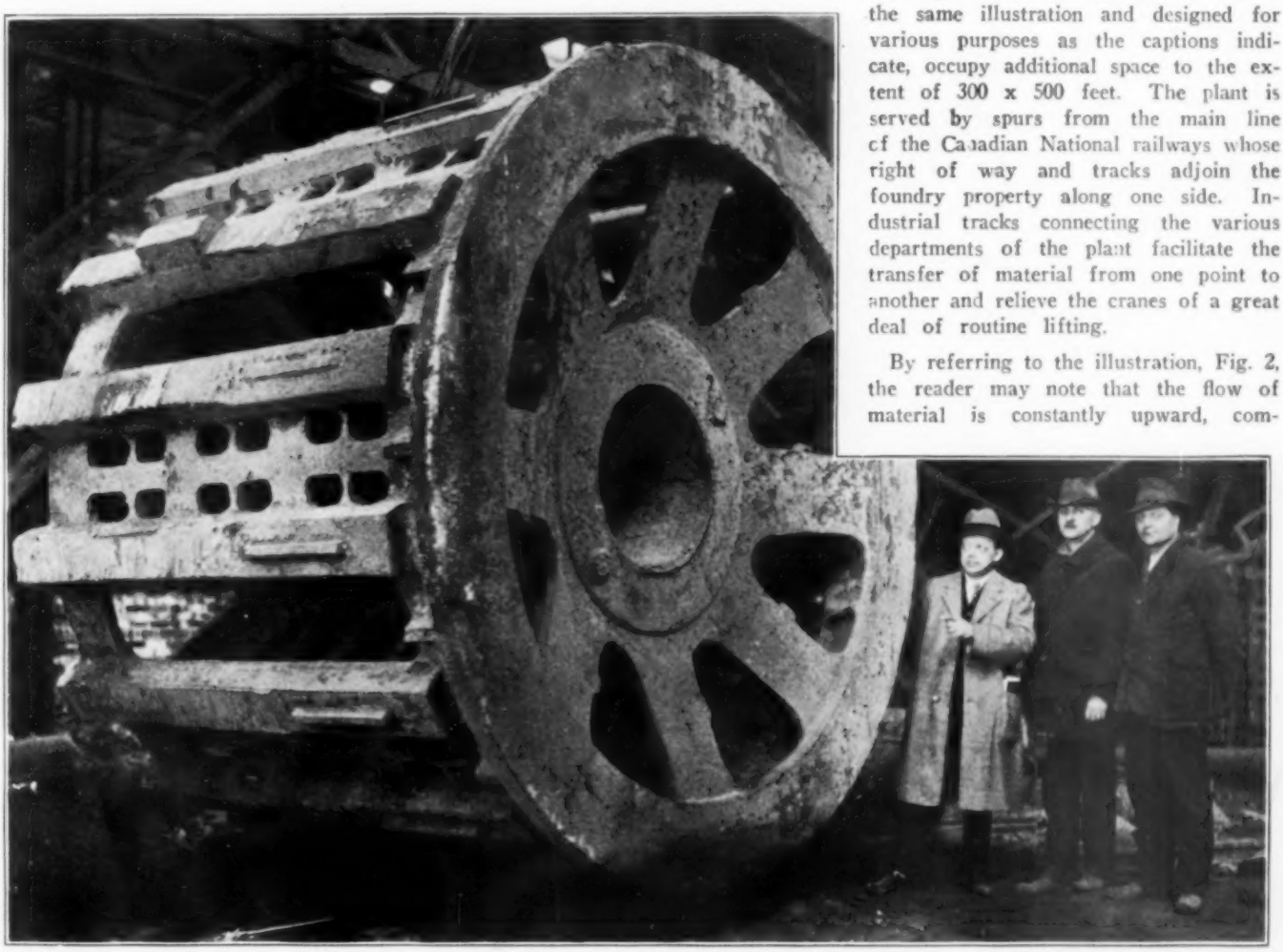


FIG. 1—THIS CASTING WEIGHING 45 TONS IS ONE OF THE HEAVIEST TURNED OUT IN ANY CANADIAN STEEL FOUNDRY THE ENTIRE MOLD INSIDE AND OUT WAS FORMED FROM A SET OF DRY SAND CORES ASSEMBLED IN A PIT IN THE FOUNDRY FLOOR

mencing with the stock yard shown near the bottom of the illustration and closing with the cleaning, annealing and inspection department near the top. Bearing this fact in mind it is apparent that the logical method of presenting a description of the foundry is to begin at the lower left corner and move upward by successive steps through the various departments.

The group of buildings shown at the lower left in Fig. 2 includes three devoted to pattern storage; one machine shop 74½ x 220 feet equipped to handle repair and maintenance work incident to the operation of the plant; one brick storage 30 x 151 feet, housing building brick for the furnaces besides the nozzles, sleeves and stoppers for the ladles; a combined patternshop, store room and room containing the transformers 50 x 160 feet; a laboratory 30 x 60 feet and a power house 50 x 98 feet. Five large oil tanks with a combined capacity of 800,000 gallons of oil are buried under ground a short distance to the right of the power house. Suitable pumping equipment in a small building close to the tanks drives the oil through pipe lines that terminate in burners in the melting furnaces, core ovens and ladle dryers. With the exception of the two electric furnaces, and the annealing ovens, oil is used exclusively for fuel in every operation in the plant that involves the application of heat.

Extensive Stockyard

Five compressors in the power house have an aggregate capacity of 4300 cubic feet of air per minute. Each one is driven by an individual motor and they range in size from a compound machine made by the Ingersoll-Rand Co., New York direct driven from a 300-horsepower synchronous motor made by the Allis-Chalmers Co., Milwaukee, and capable of delivering 1500 cubic feet of air per minute, down to a small single machine belt driven from a 50 horsepower motor made by the Canadian Westinghouse Co. and with a capacity of 320 cubic feet of air per minute. The relative position of the various machines and accumulator tanks may be noted in the illustration Fig. 2. Power for operating the plant is brought in over heavy-duty wires from the hydroelectric installation at Niagara Falls. The electric furnaces in the foundry when in use, are supplied from the same source.

The stockyard extends 700 feet alongside that part of the building containing the melting furnaces. It is spanned by three cranes with a 60-foot span and lifting capacities of 7½, 10 and 7½-tons, made respectively by the Northern Engineering Co., Detroit; the Cleveland Crane & Engineering Co., Wickliffe, O., and the Shaw Crane Co., Muskegon, Mich. The cranes unload the pig iron and scrap from the railroad cars that are shunted into the yard and afterward load the same materials into the charging pans that are employed in charging the furnaces. The steel pans are loaded on buggies that travel on a narrow gage track passing directly in front of the charging doors in the battery of melting furnaces. The pans are picked up in turn by a charging machine equipped with a long ram which engages the end of the pan, lifts it from the car, inserts it through the open furnace door, rolls it over to dump the contents, then withdraws the empty pan and deposits it on the buggy. The operation is repeated until the required amount of material has been deposited on the furnace hearth.

Steel for the castings is melted in a battery of five basic open-hearth furnaces and two electric furnaces of the heroult type. Each electric furnace has a rated capacity of 6 tons. The

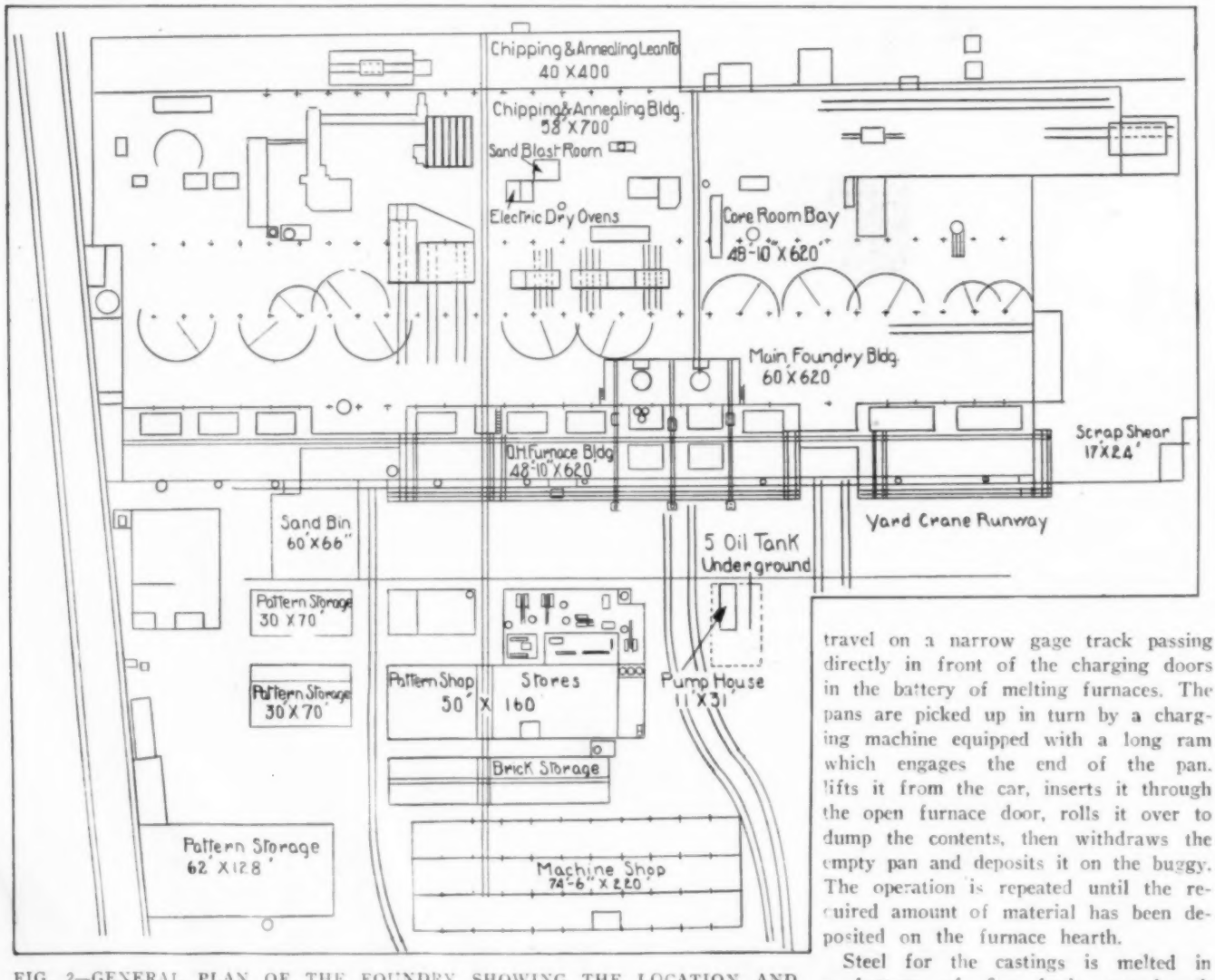


FIG. 2—GENERAL PLAN OF THE FOUNDRY SHOWING THE LOCATION AND SIZE OF THE VARIOUS UNITS MAKING UP THE CASTING PLANT—THE MATERIAL FLOWS SUCCESSIVELY FROM THE STOCKYARD SHOWN AT THE BOTTOM OF THE ILLUSTRATION TO THE CLEANING AND SHIPPING ROOM AT THE TOP

FORMULAS FOR VALUES OF GEOMETRIC MEASUREMENTS

PROPERTIES OF CIRCLES

Circumference = Diameter of a circle x 3.1416

Circumference of an equal circle = Side of a square x 3.574

Circumference = Radius of a circle x 6.2832

Circumference of circumscribed circle = Side of a square x 4.443

Area = Square of the radius of a circle x 3.1416

Area = Square of the diameter of a circle x 0.7854

Area = Square of the circumference of a circle x 0.07958

Area = Half the circumference of a circle x half its diameter

Radius = Circumference of a circle x 0.15915

Radius = Square root of the area of a circle x 0.56419

Diameter = Square root of the area of a circle x 1.12838

Diameter of an equal circle = side of a square x 1.128

Diameter = Circumference of a circle x 0.31831

Diameter of circumscribed circle = side of a square x 1.1142

Side of an inscribed square = Diameter of circle x 0.7071

Side of an inscribed square = Circumference of a circle x 0.2251

Side of an equal square = Circumference of a circle x 0.2821

Side of an equal square = Diameter of a circle x 0.8862

Side of an inscribed equilateral triangle = Diameter of a circle x 0.8660

FORMULAS FOR VALUES OF GEOMETRIC MEASUREMENTS

PROPERTIES OF SPHERES

Surface area = Circumference of a sphere x its diameter

Surface area = Square of the circumference of a sphere x 0.3183

Surface area = Square of the diameter of a sphere x 3.1416

Cubical content = Cube of the diameter of a sphere x 0.5236

Cubical content = Cube of the circumference of a sphere x 0.016887

Cubical content = Surface of a sphere x one-sixth of its diameter

Side of inscribed cube = Radius of a sphere x 1.1547

Side of inscribed cube = Square root of one-third of the square of the diameter of a sphere

MISCELLANEOUS FIGURES

Area of an ellipse = Multiplying both diameters and 0.7854 together

Doubling the diameter of a circle increases its area four times

Cubical contents of a cone or pyramid whether round, square, or triangular = Area of its base x one-third of its altitude

Area of rectangle = Length x breadth

Circular inches of an equal circle = Square inches x 1.273

Area = Base of a triangle x one-half the altitude

Area = Altitude of trapezoid x one-half the sum of its parallel sides

THE FOUNDRY DATA SHEET, JAN. 15, 1925

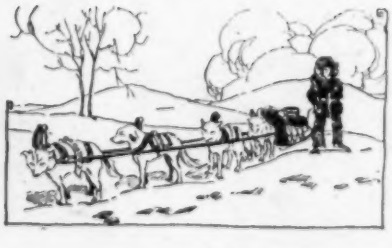
Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

Note—This sheet may be cut into two sections, 5 x 7 inches, and may be readily bound in note book form.

Around the World with The Foundry

Little Journeys to the homes of our readers

Alaska!



ALMOST inside the Arctic circle, under the shimmering glare of the far-flung Northern Streamers, jealously guarded by the brooding spirit of the great, lone land, untold treasures of the earth's red gold lay undisturbed for centuries until the Argonauts of the North, who had tramped the far trails from Old Mexico to Bering sea, poured into a land where it was said in the late 90's there was no law of God or man.

For the successful prosecution of the mining industry, immense quantities of machinery had to be freighted from San Francisco, Seattle, Portland and Vancouver; but machines wear out and break and with navigation closed for practically eight months in the year, it soon became evident that local foundries were imperative necessities.

The men who assumed charge of these plants were graduates of American foundries, accustomed, through the columns of The Foundry, to keep abreast of the times and it is only natural to find that this guide, counsellor and friend is delivered twice each month to one of the only two foundries in Alaska, the Enterprise Foundry Co. of Juneau.

"Wherever metals are cast you'll find THE FOUNDRY"

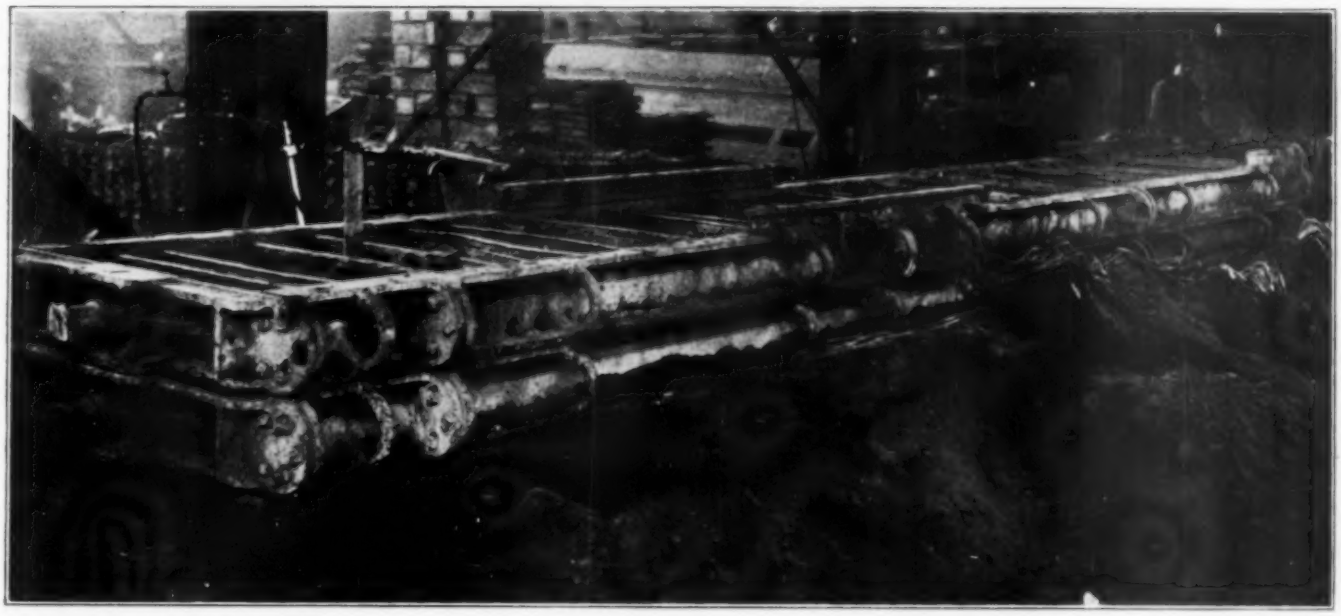


FIG. 3—LONG LOCOMOTIVE SIDE FRAMES ARE MOLDED IN A STEEL FLASK ARRANGED IN TWO PARTS FOR CONVENIENCE IN HANDLING—THE CASTING IS POURED THROUGH A SINGLE RUNNER LOCATED NEAR ONE END

open-hearth pattern includes two 35-ton, two 20-ton and one 10-ton furnaces. The open-hearth furnaces are employed continuously, but the electric furnaces are more or less intermittent in operation depending on the volume of available business and the character of the steel required for certain classes of work. Recently their application has been further hindered by a raise in the rate for electric current authorized by the Hydro-Electric commission of the province of Ontario. Active protest against the measure has been filed by all the large consumers of current throughout the province and among other features, the future electric melting of steel will hinge largely on the final outcome. Under the former rates it is stated steel could be melted economically in the electric furnace, but under the present rates, it is claimed the cost is prohibitive.

Oil fuel is employed exclusively in the open-hearth furnaces. It is introduced through a special type of burner developed by the Hauck Mfg. Co., Brooklyn. The efficiency of the device may be inferred from the claim that in usual practice and charging cold stock, four 30-ton heats are tapped in each 24-hour period.

A pneumatic device developed in recent years and up to the present used principally for applying liquid cement or concrete in various forms of building construction, has been adapted in this foundry for daubing the ladles with a thin layer of slurry over the bricks. The ladles are dried and heated in the usual manner from the flame of a burner inserted under a hood. The pipe supplying the burner is hinged at a point beyond the ladle so that the swinging hinged section may be inserted or withdrawn from the ladle at will.

The main foundry bay 60 x 620 feet extends the full length of the building in front of the furnaces and is devoted altogether to molding and pouring the castings. Small, green-sand molds are

FIG. 4—AFTER THE MOLD IS DRIED, IT IS ASSEMBLED ON AN INCLINED FOUNDATION MADE UP OF TWO LONG I-BEAMS WHERE IT IS POURED FROM THE LOWER END—THE STRAIGHT FOUNDATION INSURES A STRAIGHT CASTING

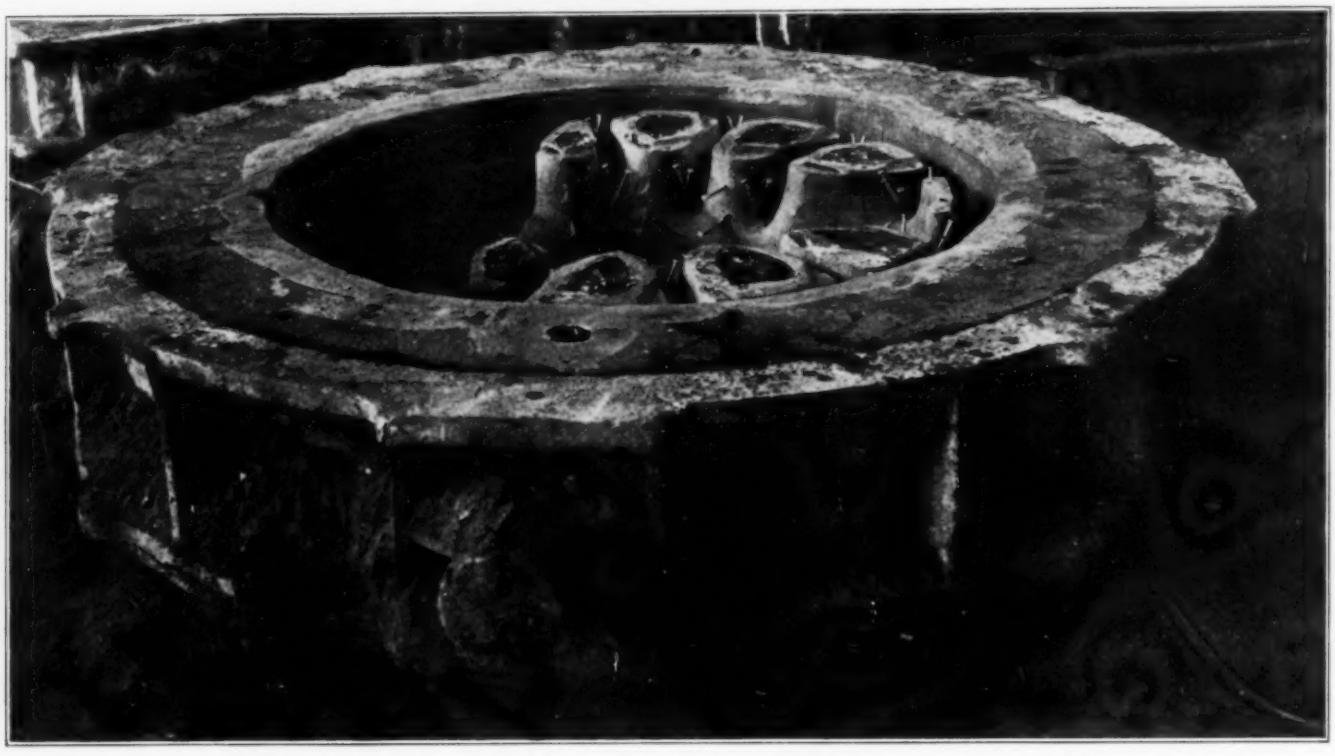


FIG. 5—DRIVING WHEELS FOR LOCOMOTIVES ARE POURED THROUGH A SINGLE RUNNER WHICH ENTERS UNDER THE BOTTOM OF THE RIM

made at one end. Small and large dry-sand molds are prepared for the ovens at the other end. The dried molds are assembled and poured on that part of the floor occupying the center of the bay. Many of the molds, cores and castings are heavy and bulky, but ample lifting and handling facilities are afforded by four cranes made by the Shaw Crane Co., Muskegon, Mich., one with a lifting capacity of 40 tons and the remaining three of 25 tons each. The traveling cranes are supplemented by five jib cranes located close to the columns on the far side of the bay from the melting furnaces which are shown in Fig. 2. Other equipment in the main bay includes several small, squeezer, molding machines made by various interests and one large jolt machine made by the Herman Pneumatic Machine Co., Pittsburgh. These machines are employed in making green sand molds. The dry sand molds usually are made in large flasks and the sand is rammed with pneumatic rammers. Small parts for drawbar equipment are made on a pair of small stripping plate machines and stacked for pouring as shown in Fig. 9. A large runner near one end of the flask extends from the top to the bottom and serves for both runner and riser. A core sand runner cup is placed on the upper cope to serve as a pouring basin and a small weight on the upper cope serves as a weight for the entire stack. The molds are stacked primarily for convenience in pouring. All the steel

FIG. 6.—THE MOLD FOR THE SIDE FRAME IS LOADED IN TWO SECTIONS ON THE OVEN CAR—LATER WHEN IT IS ASSEMBLED A STOPOFF CORE CONFORMING TO THE SHAPE OF THE CASTING IS PLACED IN THE RECESS PROVIDED FOR THE PURPOSE ON THE ADJOINING ENDS OF THE MOLD

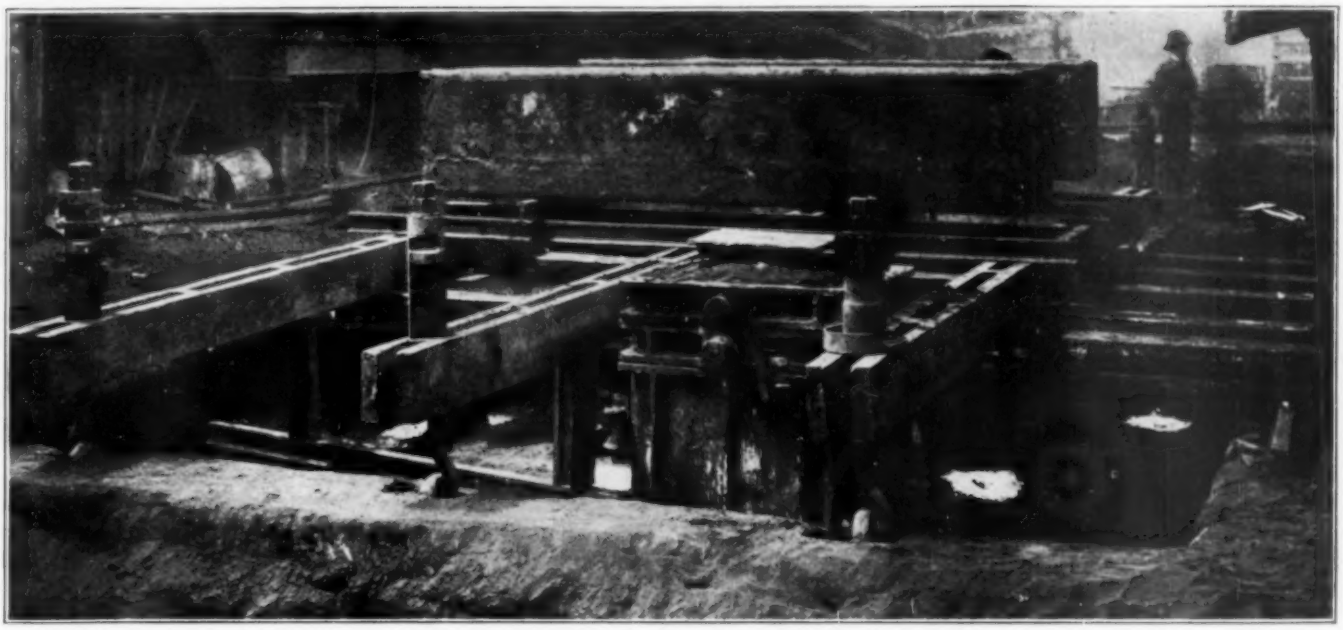


FIG. 7—LARGE MOLDS ARE ASSEMBLED IN CONCRETE LINED PITS IN THE FLOOR AND ARE BOUND DOWN SECURELY THROUGH BOLTS ATTACHED TO LOOPS ANCHORED IN THE CONCRETE WALLS

is poured from a bottom-pour type of large crane ladle and the stacked molds reduce the number of times the ladle has to be shifted and also the number of times the stopper has to be lifted from the nozzle.

Up to the present no deposit of silica sand suitable for making steel castings has been discovered in Canada, or perhaps it is more to the point to say that no deposit has been discovered within reasonable distance of any of the steel casting centers. Practically all the material used in the operation of the Hamilton plant is imported. For example, the sand comes from Illinois and the clay from Pennsylvania. Green sand facing is prepared in a revolving pan mill made by the Frost Mfg. Co., Galesburg, Ill., and dry sand facing is mixed in a 6-foot muller made by the National Engineering Co., Chicago. The base of each facing sand is new silica sand to which is added a greater or less amount of old sand depending on the class of castings to which the facing is to be applied. Thus, on extremely heavy castings, new sand exclusively is employed while on the smaller and lighter castings the facing is prepared almost entirely from old sand. Sufficiently clay is added to the mixture to produce a bond and the dry sand facing is wet down with molasses water.

Several concrete lined pits are provided in the main bay of the foundry, in which the molds for large castings may be assembled and poured. Methods vary to some extent in individual cases, but the built-up method in which the mold is formed inside a set of cores is greatly favored wherever it is considered practical. An interesting example of a casting molded in this manner is shown in Fig. 1 and the way the mold appears, bolted and weighted, ready for the metal is shown in Fig. 7. Hook bolts attached to loops anchored solidly in the concrete walls of the pit hold the binders in place across the top of the assembled cores forming the mold. The high runner box shown in the center foreground is necessary on account of the manner in which the binders prevent the nozzle in the bottom of the ladle from being brought down close to the top of the mold. The runner is made of green sand, packed tightly around a set of sleeves mounted vertically to form a clean, dry and continuous passage for the metal from the ladle to a point near the bottom of the mold where it enters through a suitable opening.

Cover cores are employed extensively both on green sand and dry sand molds. In many cases it is found more convenient to make a covering core than it is to prepare a cope. In other instances a dried surface is desirable on the upper side of the mold and a covering core presents an easy solution to a problem of that character.

The core room, core ovens and mold drying ovens occupy the greater part of the space 100 x 620 feet in the two parallel bays shown next above the main foundry bay in the floor plan Fig. 2. The remaining space at the right end is devoted to the manufacture of comparatively light railroad castings in green sand molds. The space at the left is utilized for molding heavier castings in dry sand molds. The mold for the locomotive driving wheel, shown in Fig. 5, and the flask for a locomotive side frame shown in Fig. 3 are typical of the class of work handled at this end of the foundry. Details of the molding practice involved will be discussed later.

Cores are dried in a battery of three,

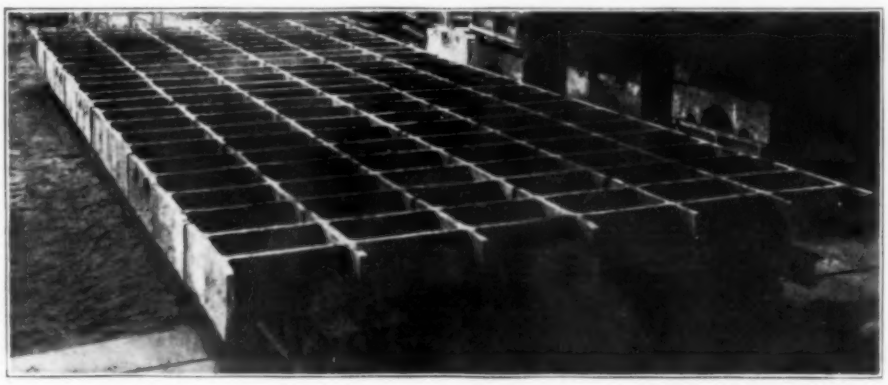


FIG. 8—OVEN CARS ARE MADE UP OF A NUMBER OF INDIVIDUAL STEEL CASTINGS MOUNTED ON FIVE LONG RAILS ONE IN THE CENTER AND TWO NEAR EACH SIDE—THE SIDE RAILS SERVE AS THE UPPER SIDE OF A BALL RACE ON WHICH THE CAR RIDES BACK AND FORTH

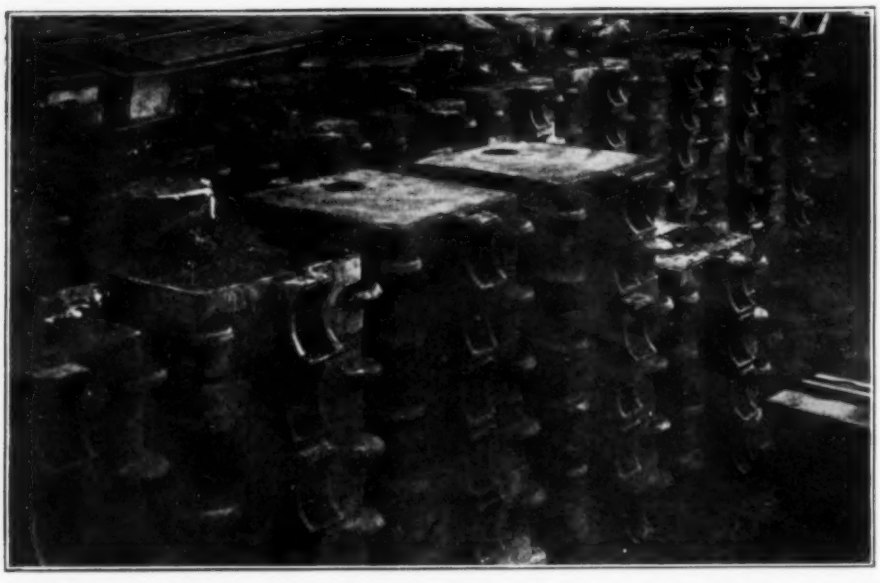


FIG. 9—MOLDS FOR SMALL CASTINGS ARE POURED IN STACKED FORMATION

double-track ovens located approximately in the center of the coreroom bay. The ovens are provided with doors at both ends and the loaded trucks are pushed in through one door and pulled out through the other. These ovens are used principally for drying drawbar cores and other small cores that enter into the production of railroad and miscellaneous castings.

Drawbar cores, shown in Fig. 10, are made in a special type of machine developed by the National Malleable & Steel Castings Co., Cleveland, and licensed for use in various foundries where steel drawbars are made according to the design patented by that firm. The corebox is mounted between two upright members in such a manner that it is free to revolve on a horizontal axis. The sand is rammed with a pneumatic rammer, a bottom plate is attached and the box is rolled over. An air operated table rises to meet the plate. The clamps are released, the corebox remains stationary, the air is exhausted from under the plungers and the table settles back to place bearing with it the core plate and core. The core is removed to a rack, the corebox is revolved into its former position and the operation is repeated indefinitely. In the event that one of the core-oven racks is not available for a few minutes, the cores are stacked on temporary stands as shown in Fig. 10.

Oil Sand Cores

By referring to Fig. 10 it may be noted that the greater part of the knuckle end and a considerable part of the remainder of the drawbar core is formed from a black coresand mixture while the straight part of the core is made from a new sand mixture. The new sand serves as a facing and insures a clean skin on the casting. The old sand when dried is not so rigid and yields readily to the contraction strain set up while the metal in the casting is cooling. Core sand, mixed with oil or other form of liquid binder is prepared in a paddle type machine supplied by the Blystone Mfg. Co., Cambridge Springs, Pa. Core sand bonded with proprietary dry binders is prepared for use in a machine of the muller type made by the National Engineering Co., Chicago. The materials employed vary from time to time depending on market and other conditions and the relative amount of new and old sand also is, regulated by local conditions.

Molds and large cores are dried in a battery of three ovens located a short distance from the core ovens and in the same bay. One oven with an overall length of 40 feet, erected especially for drying molds for locomotive side frames, projects several feet into the adjoining bay at the back.

FIG. 10—CORES FOR DRAWBARS ARE MADE IN METAL COREBOXES PIVOTED HORIZONTALLY BETWEEN TWO UPRIGHT MEMBERS—THE SAND IS RAMMED PNEUMATICALLY WITH SHORT RAMMERS AND THE CORE IS REMOVED BY GRAVITY ON A SUITABLE DEVICE AFTER THE BOX IS ROLLED OVER

Large Oven Cars

The oven car shown in Fig. 8 has been developed to meet the peculiarly exacting conditions in which loads of large flasks are exposed to a high temperature for a long period. It is 12 feet wide, 20 feet long and is made up of 11 sections assembled on a foundation of five long rails. A hook is provided at each end of the center rail for pulling the car into and out of the oven. The pair of rails beneath and close to each side serve as the upper side of a ball race on which the car travels. The lower side of the ball race is a long grooved casting that takes the place of the track usually provided in drying ovens. Among the advantages claimed for this type of car are that the balls afford support throughout the entire length and therefore the weight of the loaded car is more evenly distributed than where a car is supported on wheels a considerable distance apart. The open style of construction reduces expansion and contraction strains to a minimum and as a result the car body does not warp or crack. Pattern equipment for one section is all that is required. The car may be assembled in as many units as are considered necessary. The castings easily are made in the foundry and only a minimum amount of machine work is required in assembling the castings to form a complete car.

Tracks from the ovens extend beyond the doors from the center of one bay to the center of the adjoining bay. They terminate in the vicinity of the set-up floor where the dried molds are arranged for pouring.

The last or upper bay, 58 x 700 feet, shown in the illustration Fig. 2 together with an auxiliary leanto extending about

half the distance along one side, are devoted to cleaning, chipping, annealing, inspecting and shipping the finished castings. Nearly all the small and medium sized castings are sandblasted by equipment furnished by the Pangborn Corp., Hagerstown, Md. Heads and gates are cut off with oxyacetylene torches and brackets and fins are removed with pneumatic tools. Grinders of both the swing and stationary type are provided for removing surface inequalities. An ingenious shop kink is practiced with castings on the stationary grinding wheels. The workman loads the casting on the end of a plank suspended in such a manner from a sling that when he bears down on one end of the plank, the end bearing the casting is raised to bring the casting in contact with the lower edge of the grinding wheel.

Improved Grinding Practice

Among the advantages claimed for the method are that more pressure can be exerted on the casting, the sparks are directed down and away from the workman, less labor is involved in lifting the castings on to the end of the plank than where they are lifted on to the usual rest plate in front of the wheel about the center line and finally the workman is located at a sufficient distance to minimize the hazard incident to loose material flying from the wheel.

The general run of castings are annealed in a chamber 38 x 40 feet fired with coal and located at the extreme right end of the bay under discussion. The car is operated on a 12-hour cycle. Thus the castings gradually are raised to a temperature 1600 degrees Fahr., and then firing ceases. The temperature is allowed to drop until the close of the 12-hour period when the castings are removed and allowed to cool to atmospheric temperature.

An unusually severe inspection service is maintained on steel castings. Railroad and other interests have their own inspectors in the cleaning room who pass on the physical appearance of the castings in addition to checking the chemical analysis and the physical properties outlined in the specifications. Their word is final and absolute and permits of no appeal. The castings are inspected four times. First as they come from the molds; second after they have been sandblasted; third after they have been annealed; fourth just before they are loaded for shipment.

Mold for Locomotive Frame

Three stages in the molding progress of a locomotive frame are shown in Figs. 3, 5 and 4. For convenience in handling, the flasks are made in two parts for the drag and two parts for the cope, but the entire mold is rammed on the floor as a unit as shown in Fig. 3. An opening of approximately 1-inch is maintained between the ends of the adjoining half flasks and the pattern is provided with a suitable print for the reception of a stopoff core at this junction when the mold finally is assembled for pouring.

FIG. 11—RING CORES FOR POURING HEADS ARE RAMMED ON A SMALL JOLT MACHINE

The two half drags are lined up straight and level on long rails set in the floor for the purpose. Sand is rammed all over the bottom plates to a depth of about 3 inches followed by 2 inches of facing sand. The surface of the facing sand is scraped to a uniform straight line by a suitable strike guided from the flanges on the drag flask. The pattern for the side frame is placed on the sand and after it has been adjusted perfectly straight and level it is covered on the sides with facing sand. The remaining space in the flask then is rammed full of sand from the heap and a flat parting is made flush with the edge of the pattern and the flange of the flask. The cope is set on also in two parts. It is gaggered and rammed full of sand in the usual manner, then lifted off, finished and placed in the oven to dry. After the pattern is removed from the drag, the mold is finished, then loaded on one of the oven cars with the two parts side by side as shown in Fig. 6.

To insure a straight casting, the dried mold is assembled on the two 14-inch *I*-beams shown in Fig. 4. The beams are mounted at an incline of 14 inches in 40 feet on a permanent concrete foundation. The mold is poured through a single runner near the lower end and the mold is set on an incline to prevent the cope from *drawing down* due to a prolonged exposure to the molten steel before the mold is filled. With the mold set at the incline shown it readily is apparent that the steel will come in contact with the cope before the mold is one quarter full and that it will continue to support the sand in the cope as it progresses toward the upper end of the mold. The cope is removed as soon as possible after the metal has been poured. The various bodies of sand between the transverse ribs in the mold are reduced to shells before the mold is placed in the oven. The space in the inside of the shells is filled with loose sand before the mold is assembled. This precaution is observed to facilitate contraction of the casting which amounts to almost 10 inches in overall length.

Foundrymen Optimistic

Seattle foundrymen are looking forward to more prosperous times owing to numerous inquiries received for the near future which indicate fairly active business for January. Many plants have ordered their supplies of pig iron for the first half of the year. The local association of foundrymen is about to try a plan of pooling the members purchases on the theory combined orders may be placed to better advantage. They have combined to purchase 650 tons of coke guaranteed analysis, price and delivery. A similar plan is considered for purchasing pig iron in the near future.

Founding Limited in Mexico

American Operating Brass Foundry in the Southern Country Tells How Business There Must Be Cultivated—Each Foundryman Must Work Out Problems—Numerous Revolutions Hinder Development

BY H. H. MILLER

NO GOVERNMENT reports or data of any kind covering the foundry industry are available in Mexico. There are no foundry associations, no foundry publications, and no attempts at co-operation or exchange of ideas between foundry owners and operators. Each foundryman and would-be foundryman works out his problems the best he can for himself and then as a rule is not inclined to give useful information to his neighbors and competitors.

The Consolidated Rolling Mills & Foundries Co., of Mexico City, have perhaps the best equipped nonferrous foundry in Mexico. It operates it in connection with its steel plant and makes brass and bronze castings of all kinds, and a standard line of globe valves that compares favorably with the United States product. There is another brass foundry in Guadalajara, state of Jalisco, making a line of valves. Aside from these plants the writer does not know of anyone manufacturing a standard line of either brass or aluminum goods for the market. There is no cold-rolled, sheet or ornamental brass made in Mexico.

With few exceptions all of the brass foundries, aside from some that are operated by mines, smelters and industrial plants to take care of their own work, are run as adjuncts to iron or steel foundries, and in some cases to blacksmith shops. They do strictly a jobbing business, for customers in their immediate vicinity.

Their orders come from mines, smelters, railroads, ranches, and industrial plants for reserve stocks, repairs and replacements. This takes in a wider range of work than usually goes to the jobbing shops in the states because of the difficulties and delays incident to getting machinery parts and repairs from the United States and Europe. Here, instead of wiring to the factory or a service station for a new part when something breaks, the general custom is to go to the local foundry or machine shop and order one made. The cost is usually considerably more than that of a piece from the factory and it may not be as well finished, but if it will answer the purpose and can be delivered promptly the question of price and appearance is not considered. Pieces of cast and malleable iron often are replaced with brass castings and a few brass foundrymen who have a reputation for giving prompt attention to rush jobs take a number of these orders away from the iron foundries that as a rule are slower on deliveries.

In the days before the revolutions the plants carried large reserve stocks of everything they were likely to need for several months, and even years ahead; but during the last few years they have been drawing heavily on these reserves and buying only whatever was needed for immediate use after stocks were exhausted.

In some parts of the country the work for the sugar mills and refineries is a large item. Here in Torreon, while the volume of work we do is not so very large, it is varied. For the local smelter we make the class of castings mentioned, but in smaller quantities. For the cotton seed oil mills and soap factories we make several kinds of pipe fittings, press boxes, soap dies, gears, pinions and many special castings as well as the regular line of round and hexagon sticks, bushings and general repairs for pumps, motors, and engines.

The Laguna district of which Torreon is the commercial center, is primarily an agricultural country and the success or failure of the crops depends to a large extent on the flood waters of the Nazas river. When there is plenty of water and not too much revolution the ranches give a lot of work to the foundries and machine shops. They use some brass in the cotton ginning plants, the narrow gage locomotives and cars, steam engines, gas and gasoline engines and pumping plants. There still are some old style gin presses in operation using a brass nut weighing about 500 pounds and once in a great while we have an order for one of them. The hardest jobs we get from the ranches are runners for the centrifugal pumps used for irrigation. They require expert patternmakers and coremakers. We have cast about 10 church bells in the past two years. Few aluminum castings are made in Mexico. We probably use more aluminum for patterns than anything else, and most of them are made from scrap aluminum.

A large per cent of the brass castings used in Mexico are cast entirely from scrap brass. Many of the master mechanics at mines, smelters and industrial plants make their own brass castings. Their equipment generally consists of a small coke furnace, a pair of tongs, a crucible and whatever kind of molding sand they can dig in their immediate vicinity. They use scrap brass with no fluxes or deoxidizers. While no one of this class makes many castings and no large ones, there are so many of them that in the aggregate they take a considerable amount of work away from the regular foundries.

Not all the foundries operated by the industrial plants, mines and smelters are included in the class mentioned, but the exceptions are few and far between. The American Smelting & Refining Co. and the Penoles Mining Co. have foundries for brass and iron in connection with their Monterey plants, and the former company has another foundry at Aguascalientes. All three have good equipment, are handled by competent foundrymen, and turn out good castings.

At times during the revolutions some of the regular foundries were closed down leaving a number of molders out of employment. Some of the molders joined the revolutionists and became captains or generals and others opened up brass foundries. Their foundries were generally in the corner of a blacksmith shop or small machine shop, and their equipment was extremely limited. The native Mexican has the world beaten for inventing laborious and complicated ways for doing a simple job, and on the other hand, sometimes, of doing a difficult job with whatever crude means he many find at his disposal.

If firebricks were not available for furnace lining, common construction bricks were used and sometimes even the sun dried adobes. When the World war cut off the supply of crucibles, they built cupolas of old boiler shells,

From a paper presented at the Milwaukee convention of the American Foundrymen's association, Oct. 13-16, 1924. The author operates a brass foundry at Torreon, Mexico.

sections of smokestacks, or galvanized iron tanks, and used hand driven forge blowers for air supply. For small castings up to 4 or 5 pounds they set a clay lined ring or shell on the blacksmith forge and used the cast steel body of the 3-inch shrapnel shells for crucibles. These were inexpensive crucibles and the supply unlimited, for the landscape here was well sprinkled with them from time to time.

As a rule they did not know anything about fluxes or the compositions of high grade bronzes so the lack of prime materials did not bother them. One of our molders once told me that the only *liga*, alloy, they used was a little copper sometimes.

Railroads Have Own Foundries

Since the railroads have been under government management, they have installed iron and brass foundries in most of their shops. They have 10 or 12 in operation, but I am not in a position to say anything about the class of work they turn out, or of the efficiency their organizations.

All kinds of devices for melting are employed. The writer knows of only one electric furnace being used for brass and that is a 750-pound capacity furnace in the Consolidated Rolling Mills & Foundries Co., of Mexico City.

For linings the Mexican foundrymen use whatever they can find closest at hand. The railroad shops use regular fire brick that they chip to more or less of a wedge shape and set in fireclay and high silica sand. Here we use fireclay purchased from the local hardware stores and a sand, found in certain parts of the bed of the Nazas river, that is about 92 per cent silica. We mix one part of the fireclay with two parts sand and ram it in the two halves of the furnace shell around a wooden core. By patching it once in a while we get from 30 to 50 heats out of a single lining. The only cost of the sand is that of hauling it a distance of about two miles from the river, so linings are not very expensive.

Perhaps 80 or 85 per cent of the brass furnaces in use in Mexico are of the pit type for coke and crucibles. Some use cupolas for the large castings and for very small ones improvised furnaces on the blacksmith forges.

There are no deposits of molding sand that the writer knows of which are being exploited and offered to the foundry trade. Molding sand takes a high freight rate here, being put in about the same class as fire clay and if shipped any long distance the cost is almost prohibitive, so each foundryman tries to locate a sand supply as near as possible to his foundry and get along the best he can with it. My sand supply is less than two miles from the foundry. I can not say very much for its quality, but so far it is the best we have been able to find.

In the railroad foundries all the molders and, so far as I know, all the superintendents and foremen are Mexicans. In most of the large privately owned foundries the foremen are foreigners and all the molders natives of the country. Under proper direction and with proper training, they make good molders and some do just as good or better work than the average American. As a general rule, however, they work slower and require more helpers than in the United States. They lack initiative and it is difficult at times to get them to adopt new methods and then to keep them from drifting back to the old ones to which they have been accustomed. The Mexican is a slave to custom and likes to do things as he has always done them and as his forefathers did before him. He shirks responsibility and is never at a loss for a reason outside of himself for anything that turns out badly. It happens frequently that he will use an infinite amount of care and patience in doing a difficult piece of work and then slight some easy and insignificant part, like anchoring or venting a core or putting on enough weights or clamps and lose the casting.

A patternmaker in a jobbing foundry in Mexico has to be an expert to be able to handle all the jobs that come in to him. There are a few here as proficient in their line as can be found in any part of the world and who are equal to any and all emergencies. Ther are many more, though of the class ranging from mediocre down. Most of the first mentioned class are foreigners and the better class of Mexican patternmakers have been their understudies.

One of my customers thinks he has a patternmaker. What he sends out, however, are really models of what he wants, holes and everything, with no signs of core prints nor core boxes. Not long ago he sent me a wooden bushing 6 inches in diameter, 18 long, with a 4-inch hole through it. To facilitate molding he made it in two halves put together with dowel pins. This fellow is an advocate of split patterns, but very often splits them in the wrong place.

Old Castings as Patterns

We use old and broken iron castings for patterns here more than they do in the states. American molders use profane language when this kind of a job is handed to them; a Mexican molder takes it as a matter of course and patiently worries along with it until it is finished. Sometimes we make gear wheel molds from old broken ones, and where teeth are missing, cut out in the sand so that part of the rim will be solid. The customers ask for them that way and cut in the missing teeth with a hack saw and a file. They would rather do this than pay for a pattern.

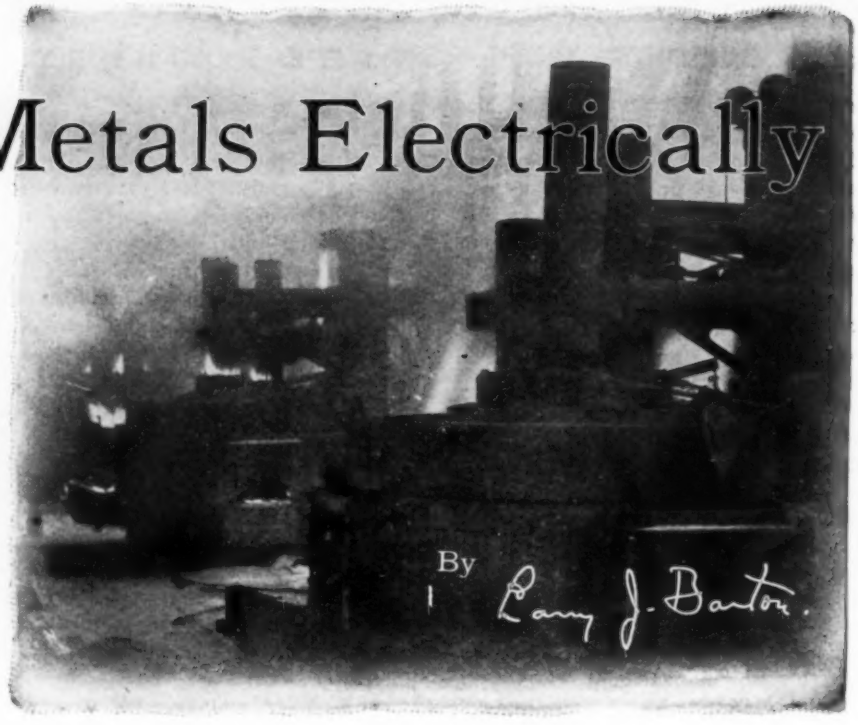
The wag that made the remark about the first hundred years of married life being the hardest might have said the same thing about trying to build up a foundry business in Mexico. It takes time, patience, and most of all personal contact and acquaintance with your customers to build up a regular trade. Neither circular nor personal letters nor any kind of advertising go very far towards getting your first orders. When the writer decided to start in the brass foundry business circular letters were sent out to everybody we could think of as prospective customers. Now in this country many people will answer communications that the average business man in the United States would throw in the waste basket without even reading, so in answer to the first circulars I received a number of courteous letters from individuals and companies telling me how much pleasure it gave them to know I was going to open up a brass foundry and assuring me of their orders just as soon as they should need something in my line.

Big Business Anticipated

I thought business was going to start off with a big rush, but orders were not received. Other circulars and personal letters were sent out with about the same lack of results, and then I tried going after them personally. It has nearly always taken a personal visit, and in some cases several scattered over a number of years, to get the first order; but after the first the rest come easier. When you once get the trade and confidence of an individual, company, or corporation here, they stay with you pretty well and any new competitor entering the field will find it difficult to get them away. Still, a personal call once in a while helps to hold them in line, and it is a good idea to drop in between revolutions just to show them you are still on the job. So I find it worth while to get around to all of them and keep on friendly terms with everyone from the general manager to the portero. The portero is the fellow stationed at the extreme outer gate, and he sizes you up as you

(*Concluded on Page 79*)

Refining Metals Electrically



Chapter IV

How Manganese Steel Was Discovered — Electric Melting Favored

By Lamy J. Barton.

MANGANESE steel falls among the true alloy steels, but the rapid increase in its manufacture during the past few years has made it a steel of such importance that data covering this metal should be offered independently.

Manganese steel first was brought to light in England about the year 1888, through an extensive set of experiments made in the plant of the Hadfields, Ltd., Sheffeld. These demonstrated that manganese, added to steel in large amounts, conferred upon the metal unusual properties, differing widely from those accepted as standard. The first castings of manganese steel were made in this country in 1892. Since that time the manufacture of this class of castings has increased until the present capacity of this country is approximately 70,000 tons a year.

This metal, due to its peculiar properties requires strict specialization. Probably four or five companies make at least 95 per cent of the tonnage used in America. The difficulties attending the commercial manufacture of this steel are many, and are not generally understood by the foundryman. Differing greatly in its properties from ordinary carbon steel, the attempt to enter this field by inexperienced operators has been the prime cause of several failures in the steel casting industry.

Manganese steel, properly made and treated, offers a metal of unusual charcteristics. Its main point of superiority over plain steel is in its great toughness and resistance to wear. As a consequence, it is finding wide use for parts subject to shock or in castings for uses where resistance to abrasion is needed. Some of its most prominent uses are in ball mills, brick making machinery, cement, clay and miscellaneous crushing mills, dredge boat and bucket parts, crane, truck, gear and sheave wheels and in frogs and rails.

While the greater portion of the tonnage made is used in the form of castings, it also finds wide use in forged or rolled products under which treatment it shows an increase in strength similar to carbon steel. Manganese steel, when cast and treated, has the following properties:

Tensile Strength, lbs. per sq. in.	100,000 to 110,000
Elastic limit, lbs. per sq. in.	50,000 to 55,000
Elongation, per cent in 2 in.	30 to 35
Reduction of area, per cent	35 to 40
Brinell hardness	180 to 200
Scleroscope	40 to 50

Toughness Its Virtue

SPECULATION as to what would have happened in the history of the world, had it not been for the invention or perfection of some device or product is idle. Nevertheless, it is intriguing. Just how far the great network of railways with their intricate web of switches and crossovers, each with points and frogs subjected to constant battering, would have advanced without manganese steel is difficult to conjecture. Suffice it to say, that for heavy duty, where shock and abrasion are encountered, manganese steel castings play a great part and doubtless have contributed a large share to successful modern railroad operation. In this article, which is the first of the chapter on manganese steel, Mr. Barton gives a brief history of the metal, and appraises the service played by the electric furnace in perfecting melting practice, in cheapening the product and in conserving waste. The one slag process of making manganese steel will be given in detail in the next installment.

The influence of the percentage of manganese on the physical properties is shown in Fig. 33. Naturally, a steel of such a character finds wide use. Great amounts are shipped to all parts of the world, from the gold mines of Alaska to the great dredges of South Africa. The great work of building the Panama canal was made possible by the use of manganese steel.

Manganese steel is practically non-magnetic, and for this reason finds wide use in the protecting plates used for electric magnets. Most of the steel parts on the famous North Pole, non-magnetic, ship were made of this steel.

While a manganese steel is extremely resistant to wear it does not owe this property to its hardness, as is shown by the tests made on both the Brinell meter and the scleroscope. The toughness appears to be due more to its great molecular cohesion, causing the particles to flow rather than tear loose from each other. Its hardness is lower on the outer skin due to oxidation of carbon.

Until the past few years, manganese steel was made from converter metal according to the method first pursued by Hadfields. A low phosphorus, low sulphur, pig iron was used in the cupolas, this iron being blown dead in the converter. To this low carbon steel, ferromanganese was added in the molten condition in sufficient amount to give the desired percentage to the steel, this figure ranging from 11 to 13 per cent manganese. The steel was blown as hot as possible, and only given a few minutes in the ladle to mix before pouring. Naturally, this steel was of a quality similar to ordinary converter steel regarding the amount

of dissolved oxide, carbide conditions, etc.

The manganese was melted either in a crucible or in a special cupola, the crucible being preferable due to the lower loss of manganese entailed in melting. While manganese steel of good quality was made by this method certain disadvantages were encountered, the most important being the difficulty in remelting the old heads, gates, spill, ladle sculls, etc. For this purpose air furnaces were used similar to the modern open-hearth furnace, but without any system of regeneration. While such furnaces proved capable of melting the steel in a satisfactory manner, this process resulted in a further loss of manganese, by metal shrinkage which allowed the carbon percentages to

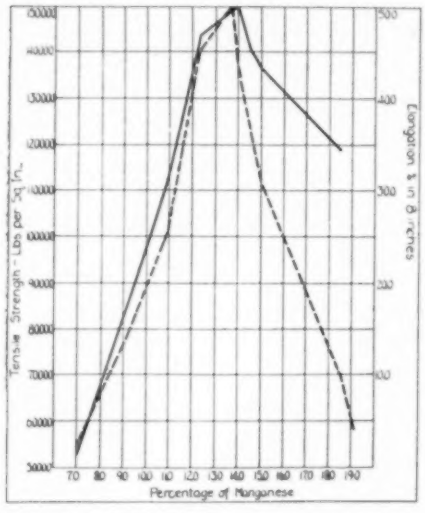


FIG. 33—INFLUENCE OF THE VARIATION IN MANGANESE UPON THE PHYSICAL PROPERTIES OF STEEL

raise the figures higher than desired. This resulted in metal of more or less irregular composition, and for a long time many purchasers refused to buy manganese steel made from old scrap. This naturally threw a heavy burden on the manufacturer to get rid of his old shop scrap, and many hundred tons of this steel was piled away, subject to the discovery of a practical method of reclaiming it.

Enter The Electric Furnace

When the electric furnace first began to assume prominence in the manufacture of steel castings, it was hailed as the cure-all of manganese steel making. Experiments naturally followed but at first, due to the lack of experience of electric furnace melters, results were poor. The same also was true in making the common grades of carbon steel castings during the early days. However, as time passed the electric furnace proved itself and manganese steel entered upon a new era. In 1918 several electric furnace installations were making manganese steel along with their ordinary grades of castings. In that year the American Manganese Steel Co., one of the pioneers of the industry in this country, placed in operation a new shop on the Pacific Coast using the basic electric furnace exclusively. From their data of the operation of this shop, it was seen that this method of manufacture was by far the most logical, these facts resulting in a complete change to the electric furnace in all the company's plants. Since that date there have been several other installations expressly intended for making this metal.

If manganese steel as made in the converters was good metal the castings as made in the basic electric furnace might be well considered as much superior, due to the great advantages of the latter process of manufacture.

Offers a Minimum Loss

The basic electric furnace offers a satisfactory solution to every problem met in converter practice. The first of these is its power of absolute deoxidation. In the electric furnace this is effected under a heavy lime slag, and offers a minimum of loss of the costly alloy, manganese. The second is the ability to hold the metal for almost indefinite periods without excessive changes in composition, making it possible always to obtain regular analyses, as the metal may be satisfactorily held awaiting the chemists verdict. The third point is that of being able to control the temperature closely without resorting to holding in the ladle. The latter practice is likely to contaminate the metal by the formation of slag, caused by its corrosive action on the refractories of the ladles. The fourth and greatest point is its ability to make excellent metal by remelting old manganese steel scrap, without any appreciable loss of the alloy.

When the first manganese steel was made in the electric furnace, the furnace was lined in the standard manner, with a silica roof, and with common magnesite brick up above the slag line. The hearth was made of burned in magnesite, and both magnesite and dolomite were used for patching purposes. It soon was found that this latter material was not at all satisfactory for patching. While it proved acceptable during the steady operations over a weeks run, it always tended to disintegrate over the Sunday shutdown. This deposited a lot of loose material on the hearth which always tended to give trouble on the first heat of the week, by giving a high magnesia content in the slag, with its attendant high viscosity and difficulty in clearing. Furthermore, where this patching dropped it left holes, and voids, with more hearth trouble than should have been encountered. As soon as a good grade of prepared magnesite was used this trouble was eliminated.

Method of Lining Furnace

With silica side walls, trouble was experienced by the metal splashing against the banks, and rapidly eroding away the silica brick, especially opposite the arcs where the walls were the hottest. This resulted in shutting down the furnace frequently to reline, the customary procedure being to re-

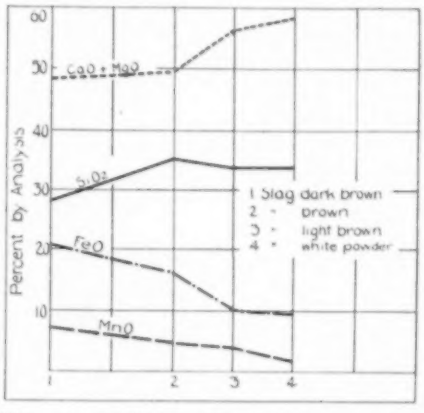


FIG. 34—COURSE OF SLAG CHANGES IN MELTING MANGANESE STEEL

pair the furnace over the week end, this being done every two weeks, and often after only a weeks operation. Consequently, this proved to be rather expensive and steps were taken to find some refractory which would stand up under the severe service imposed. After trials of miscellaneous refractories a metal encased brick company was found to solve the problem. While the first cost was considerably higher, it was found that such a lining would stand up for from 6 to 8 weeks operation, and then a large part of the brick ends could be used again. Since that time this method of lining the furnaces has been standard.

Since adopting magnesite lining, better results have been obtained from the slags. Formerly, trouble was experiencd with silica running into the slags from the walls, and so contaminating them that they were cleared with great difficulty. With no silica present, outside of the roof, heavier lime slags with their greater basicity, and consequent better alloy reclaiming facilities can be used. It is found that there is a considerable saving in time necessary to bring the slag to carbide conditions. Also, it is found that these heavier lime slags cut down the man-

ganese loss when remelting old shop returns.

Disregarding for the present the remelting of manganese steel scrap, four choices of a melting process are available. These are:

1. The metallic charge of soft steel scrap can be melted under an oxidizing slag, the slag removed, a second slag added, and cleared under heavy reducing conditions, exactly as if a heat of carbon steel was being made. When the slag has reached its proper carbide condition, and powders upon exposure to the air, the ferromanganese can be added in lots of several hundred pounds at a time, the bath brought to its proper temperature and tapped.
2. The heat can be run as mentioned but adding the manganese immediately after slagging off, then adding the final slag and finishing.
3. The heat can be melted, the manganese added, and the steel finished under its first slag.
4. The ferro-manganese can be added with the charge, and the steel finished under one slag.

While the first two methods often are used, and prove to be satisfactory, there are two main objections to their continued use. First, there is a direct loss of at least 0.50 per cent manganese consisting of the alloy combined in the slag as the oxide, which is wasted when run from the furnace. Further, approximately double the amount of slag making materials—lime, spar, and sand are required. This amounts to a considerable item in a years time.

The fourth method seldom is used, it being too dangerous for consistent operations. While the amount of manganese lost could be kept low, by using heavy lime slags, there always is the danger of carbon being picked up in undue proportion, usually by an electrode breaking off. Naturally there could be no lowering of the carbon without first cutting down the manganese, and the heat would have to be cast into a low grade product or scrapped.

Consequently, the third method is finding the widest use, especially in shops where manganese steel is the main product. This method offers a distinct saving in that the manganese in the raw scrap is largely recovered from the slag when placed under reducing conditions. While this only amounts to a few tenths of one per cent, the saving in ferromanganese over any length of time constitutes an important item.

The One Slag Process

The furnace is charged in exactly the same manner in making a heat of low carbon steel, the scrap being arranged for economical melting, and no ore being added, unless there is good reason to believe that the analysis of the charge is such as to give a high carbon on the melt down. No lime is added with the charge for the same reason as given before—the great tendency to raise the hearth level.

In making up the charge it must be rembered that the later manganese addition will constitute approximately one-sixth of the initial weight of scrap charged, so that only about six-sevenths of the weight of metal desired must be charged at the start.

As soon as the charge begins to melt, and a slight pool of metal is formed on the hearth, the lime can be added. At this point only enough lime should be added to furnish protection to the steel from surface oxidation, and to give sufficient slag to assure the furnace pulling a steady load, a bare bath being conducive to heavy surging of the power input. As soon as possible a metal test should be taken, and tested by any of the standard methods for its carbon content. It is not necessary for a chemist to make this preliminary unless desired, as it is so easy for the melter to tell by fracture whether his steel is under 0.10 per cent or not.

If the test shows higher than this, ore should be added and the bath boiled until the desired conditions are obtained. If the charge was composed of ordinary grades of soft steel scrap it should always melt down under this figure, unless there has been some electrode trouble, or miscalculation in the selection of scrap.

At this period of the heat a condition similar to a heat of carbon steel is found. The metal is heavily oxidized having an approximate analysis of carbon, 0.05 per cent; silicon, 0.01 per cent; manganese, 0.04 per cent. The slag is thin and black, being heavily charged with the oxides of both iron and manganese.

The second slag now is added consisting of approximately 2 per cent of the charge, burned lime; and about 20 per cent of the lime, gravel or crushed fluorspar. After being allowed a few minutes under the arc to heat, this slag is well rabbled to thoroughly mix up the old slag with this fresh addition. It then is given a heavy dusting of ground coke and the furnace sealed as closely as is possible.

The slag now will be either a black, or a dark brown, due to the large percentage of oxides contained, but soon will turn to a lighter color. As soon as the metal becomes hot enough so that it will not chill upon the addition of the ferromanganese, this alloy may be added. The usual method is to add approximately 100 pounds at a time placing the alloy on the sill just inside the door, and allowing to remain there for at least two minutes before shoveing it into the bath. This is repeated alternately from both doors until the entire addition has been made. During this time the metal has been heating and after the final addition only a few minutes are required for the steel to reach tapping temperature.

As soon as this heavy charge of manganese is added, the slag will turn quickly to either a deep blue, or a green, depending upon the amount of manganese which enters the slag. Any oxides present in the steel will be eliminated quickly and a reduction proceeds and the metal heats up this manganese in the slag, together with the oxides of iron, will be reduced, their metallic constituents passing back into the steel. The course of such a slag is shown in Fig. 34.

Substitute Steel Scrap for Gray Iron Scrap

Question: In using scrap iron in the cupola mixture for gray iron castings will bolts, nuts, rod iron and other similar scrap harden the metal?

Answer: You cannot substitute steel scrap for gray iron scrap in the cupola mixture without changing the physical properties of the resulting castings owing to the difference in the chemical composition of the two metals. We assume that by *scrap iron* you mean cast iron scrap. Such a metal covers a wide range in its chemical composition, for example:

	No. 1 Iron	No. 2 Iron	No. 3 Iron
Silicon	1.50	2.25	3.00
Sulphur	0.12	0.10	0.07
Phosphorus	0.30	0.30	0.70
Manganese	1.00	0.60	0.30

No. 1 cast iron may be regarded in general as a low silicon iron for heavy castings, No. 2 iron for medium weight castings and No. 3 iron for light castings. As a comparison bolts, nuts, rod iron, etc., generally are made of low carbon steel, carbon ranging from 0.10 to 0.20 per cent. It is apparent that if steel scrap is substituted for gray iron scrap owing to the great discrepancy in the silicon, the tendency will be to lower the silicon content in the cupola mixture and harden the resulting castings in comparison to the amount of steel scrap used unless provision is made for addition of extra silicon when figuring the mixture.

Steel scrap is used in cupola mixtures to produce a product known as semi-steel, allowance being made for the lowering of the silicon in figuring the mixture.

Bill Meets the Expert on Heavy Ordnance

BY PAT DWYER

ONE day recently while doing a bit of gentle and promiscuous prowling in a second hand book store, I discovered a promising set of short detective stories written, or perhaps to be strictly accurate I should say published, during the early Nineties. The date of publication as it appears on one of the front pages of a book is not always a true indication of when the original manuscript was prepared. Instances are on record of manuscripts that did not pass through the printer's grimy paws or wither self-conciously under his coldly cynical glance of appraisal until several years after their unfortunate authors sweated them out of their systems. However, in this instance according to the date printed on the title page, the book was published in 1893 and by comparing some of the incidents later with my recollection of conditions prevailing about that time, I am satisfied that the book was printed immediately after it was written.

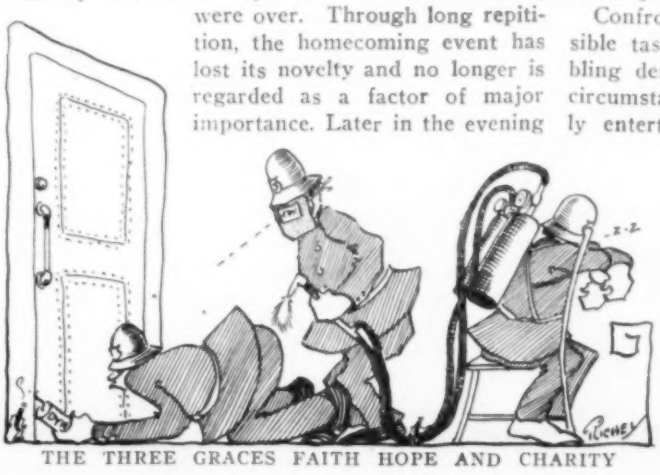
A cursory examination of the contents and an equally brief fluttering of the pages, seemed to indicate that the stories would hold my interest. The proprietor's hard eye was on me and I did not like to invite any comment by reading extensive extracts. I decided that the modest price—two bits in any form of legal tender—would not embarrass me financially. To be brief, a consideration I always bear in mind whether I am engaged in describing or discussing a subject, when I left the shop a few minutes later the treasure reposed in an overcoat pocket. The left pocket if you really insist on detail. My pipe and paper of tobacco were in the other. At various times since the beginning of my period of servitude I have been warned to refrain from the nefarious practice of dragging home books that came from goodness knows where and that had been handled probably by dozens of impossible people. In this particular instance I anticipated no trouble. The condition of the book would serve as a perfect alibi. The pages though slightly yellowed by age were as fair and clean as they were on the day the book left the bindery. In fact some of the pages had not even been cut. For some reason apparently this unfortunate volume had missed the destiny of the remaining members of the same edition and had drifted peacefully from one point to another seeking an owner or even a reader, until finally the second-hand man secured it probably at a sale of tag ends that seem to collect or gather in book stores.

This peculiar property of inanimate objects to huddle for company with other unfortunate objects of the same character is not confined to book stores. An example may be found in nearly every foundry where the foot of every column seems to act as a magnet for every bit of flotsam and jetsam floating in the vicinity.

Fortunately I attracted no particular attention when I eased myself in through the front door at night after the toil of the day and all that kind of thing were over. Through long repitition, the homecoming event has lost its novelty and no longer is regarded as a factor of major importance. Later in the evening I settled down for a quiet little spell of reading and was highly gratified to find the stories quite up to and in some instances beyond my expectations. Incidents related in some of the stories quite eclipsed the marvellous exploits of my former favorite trio, Mr. Holmes, Mr. Carter and Mr. (Old King) Brady, and aroused in my mind the liveliest feeling of admiration for the inventiveness and mental fertility of an author who also was gifted with a pleasing literary style. My tastes are simple and I derive a considerable amount of innocent pleasure from viewing a good job well done, irrespective of whether it has been done with a pen or with a set of any other tools or instruments.

One story in particular appealed to me because the writer introduced a factor which indicated how far his imagination carried him into the future. The oxyacetylene process for cutting metal has been developed into an important commercial possibility in recent years. It only was in an experimental stage at the time the book was written yet the hero in one of the stories used an oxyacetylene torch to accomplish his purpose, just as nonchalantly as any structural iron worker today uses it to cut a steel beam that happens to get in his way.

Confronted with the seemingly impossible task of raiding a luxurious gambling den where an innocent victim of circumstances was engaged in the highly entertaining, but withall expensive game of bucking the tiger, the arch detector annexed a perfectly new and shining laurel and added it to the imposing wreath on his brow by substituting an oxyacetylene torch for the usual outfit of burglar's jimmys and skeleton keys. The entrance to the magnificent den of vice and iniquity was guarded by a massive steel door—chilled



THE THREE GRACES FAITH HOPE AND CHARITY

steel, whatever that is—cunningly designed on a scale to defy anything short of a charge of dynamite sufficient to destroy the entire building and contents. The police department had thrown up its collective hands in despair and had acknowledged bitterly that it was foiled. Could any situation be fairer than that, I ask you? The answer, of course, delivered in a ringing voice and in perfect unison is that it could not.

With everything apparently against him and with his friends' faith in his ability reduced to a point about 1 degree above absolute zero, the lad daintily flicks a speck of imaginary dust with a pure white silk handkerchief from the toe of an immaculate patent leather shoe. Ah! That is the signal! A patrol wagon, at that period rejoicing under the euphonious title *Black Maria,* that has been lurking in the vicinity for some time, dashes up to the steps and discharges half a dozen burly cops each one armed with a gas tank. Amid a breathless silence the tanks are arranged in a row while one of the operators applies the nozzle of a burner to the door. The remainder of the story easily may be anticipated.

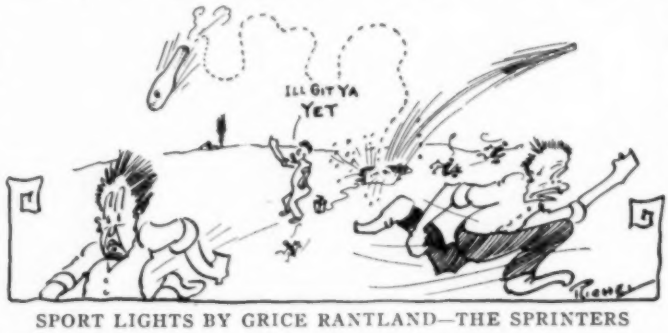
With the aid of the torch a panel quickly was cut out of the door to form an opening through which a squad—or is it a covey?—of police dashed in pursuit of the nefarious gamesters who had for so long and so insolently operated in defiance of all the statutes made and provided by the city and state for suppression of vice as carried on under the guise of games of chance.

Of course the criminals were caught and thrown with little ceremony into a patrol wagon—same old Maria—and bundled off to jail. The story ends right there, but I think we are reasonably safe in assuming that several conferences and telephone conversations occurred during the night. When the prisoners appeared before the beak in the morning, no person was present to press a charge against them and the judge had no alternative but to reluctantly release them—with an apology. Probably the reason the author omitted this conclusion from his story was because it resembled real life too closely to be included in a book of fiction.

In view of the extent to which the oxyacetylene process has been adapted in recent years to the reduction of iron and steel scrap to a size that can be charged into a melting furnace, I directed Bill's attention to the story one night shortly after I had read it. He admitted that this here now writing guy—to use his exact term—apparently was ahead of his time, but then these birds are a queer bunch any way you take them.

"Talking about breaking scrap," said Bill, "I met a lad at the recent foundry show in Milwaukee who told me a peculiar story of the methods adopted at one plant in an effort to break an old cannon into a size suitable for the cupola.

"The cannon had been purchased several years before as part of a miscellaneous lot of scrap, but on account of its peculiar shape and size had been ignored continually and consistently by the gang engaged in making up the charges for the cupola. The old line of least resistance is followed perhaps more faithfully in the average foundry yard than it is in any other place of equal area in the world.



SPORT LIGHTS BY GRICE RANTLAND—THE SPRINTERS

"After the outbreak of the World war and the consequent rocketing of prices on all forms of scrap, the old lump of iron assumed to itself a gradual increase in value. The foundry manager decided it should be utilized and to that end held a council to decide how it should be broken. The members of the council unanimously were of the opinion that the cannon was a slacker and no longer should be countenanced in that unpatriotic attitude. However, when they placed it under the drop ball they found that not only was it a slacker, but apparently it also was a hardened and concientious objector. After they had expended enough time and labor on the job to pay for half a dozen cannon they gave it up. The manager was a determined kind of a lad—probably one of the reasons why he was manager—and would not willingly admit that he was beaten. He had read of cannon bursting through the force exerted from an overcharge of powder and decided to give the old cannon a charge worth talking about.

"The gun was loaded on a wagon and pulled by a team of horses to a vacant area beyond the town where the explosion would do no damage. One of these great open spaces so eloquently and frequently referred to by our movie authors. One of the places where men, we are gravely informed, are men and where cannon presumably are cannon.

"The amateur gun men anticipating a scene of general annihilation unloaded the cannon from the truck and laid it well and truly on a selected spot on the surface of the state of Ohio with its muzzle pointing in the general direction of the state capitol at Columbus. A strict regard for the beautiful and comparatively rare virtue of truth compels the statement that the usual ceremony of figuring the range, trajectory, angle of elevation and other highly technical details, was omitted on this occasion. A short section of telegraph pole was pared to the correct size with an axe and then driven into the muzzle with a sledge hammer after the gun had been filled about half full of powder. A long fuse was attached to the touch hole. It was lighted with due ceremony by the chief gunner and then the crew prudently retired a reasonable distance—say, about half a mile—where they duly and thoughtfully crossed their collective fingers and full of patience and hope waited for nature to take its course.

"The ways of nature, as some jolly old blighter has so feelingly observed in a burst of frankness are fearful and wonderful to contemplate. The present instance proved no exception to the general rule. The charge of powder exploded with a perfectly gorgeous bang and the gang had visions of a day's work in gathering up the fragments. They raced to the scene and found the cannon whole and entire and calmly reposing on its side, apparently satisfied that it had done all that reasonably could be expected from a cannon out of practice and on such short notice. The wood plug had disappeared and so far as I know its whereabouts remains a mystery down to this day.

"After anathemizing singly and collectively all the guns and the men who made them from the days of the Spanish Armada down to the present and with a special curse on the old veteran lying on the ground, the party decided that any further effort would simply be a waste of time. Good, honest artizans, they could not see any sense in sticking around doing nothing. They moved unanimously that the job be abandoned and the missbegotten lump of iron left where it was. The manager, after the fashion of managers, did not see eye to eye with these gallant lads. He had come out there to smash the gun into smithereens—a term I need hardly remind you is modern Greek for a miscellaneous collection of small particles—and he did not propose to quit until the job was done. That's the kind of a little guy he was. See?

"He sent the team back to the plant

with orders to return with three stout poles, a length of chain and a block and tackle. When the material arrived he rigged the three sticks in a tripod over the gun. He packed the gun with powder almost to the muzzle and drove a second wood plug into the opening. Then he hooked one end of the fall to the top of the tripod, the lower end of the fall was linked into a short length of chain reeved through a small hole placed there for the purpose in the closed end of the gun. The line from the lower fall was passed through a snatch block anchored to a convenient stump and the end of the line was attached to the back axle of the truck employed for hauling the gun from the plant to the field.

"The driver, after the fashion of drivers, politely intimated to his team that a little action would be appreciated and the team obligingly and kindly walked away with the line until the gun was suspended vertically with the muzzle just clear of the ground. The free end of the chain was wrapped around the top of the tripod and when all was secure the hoisting apparatus was removed.

"A second length of fuse was attached where it was calculated to do the most good. It was lighted and the crew once more retired to the safety zone. The manager rubbed his hands vindictively and declared by the nine gods of war with the shades of Ponitus Pilate and old Billy Krupp thrown in for good measure that if the illegitimate spawn of the devil did not burst this time he would eat it. The charge exploded while he still was vaccilating between whether he should eat it raw, with a pinch of salt or with a generous dab of mustard like a hot dog.

"When the smoke cleared the gang once more came racing over the top and legged it for the objective in no man's land. Here the more supernaturally minded decided that the gun really had been the property of the Evil One and the more they left it alone the better. It had disappeared, as our rising young generation is wont to declare in its fluent and picturesque vocabulary, positively and absolutely. It was gone. Vanished.

"At first the crowd threw their eyes aloft, which when you come to think of it is a rather neat little acrobatic feat in itself. They had a kind of instinctive feeling that a shower of iron fragments was due to descend from the general direction of the clouds. Having waited a reasonable time without any result except incipient symptoms of stiff necks they skillfully retrieved their eyes and cast them on the ground. Then they discovered that the mystery was a mystery no longer. Little incidents like this prevent life from becoming drab and monotonous.

"The force of the explosion had driven the wood plug into the earth to a distance that never has been measured. The recoil had snapped the chain and the gun under the influence of the force of gravity—good old force, always on the job—had followed the plug into the hole, upright, intact and unbending to the last. The upper end was discernible about 4 feet below the surface of the ground. The manager decided that the chain of extraordinary circumstances relieved him of his vow. Further, he declared he was neither a mole nor a miner and so far as he was concerned the cannon could remain in the hole until a crust of ice formed over the home of its true owner.

"I'd like to blow around here about 100 years from now when the march of civilization has sprayed inhabitants over that part of the country. Imagine the surprise of some husky steam shovel man engaged in digging for the foundation of a skyscraper when the prongs of his shovel came up with a bump and a screech against the side of the old cannon. Think of the excitement in local and even in national antiquarian circles and the learned theories advaced by sundry and divers be-spectacled gentlemen to account for the presence of this warlike relic so far from the scene of any recorded battlefield."

"When it comes to theories," I said, "If you will pardon me for projecting myself into the conversation, I am some little theorizer myself."

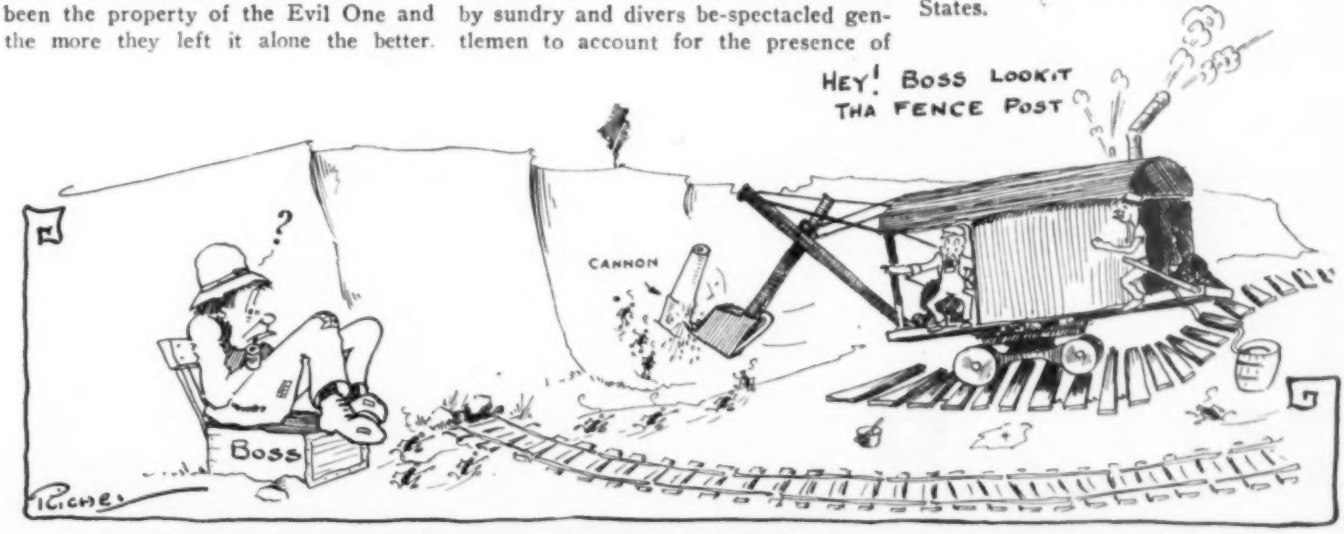
"Well," said Bill politely, "Shoot."

"Shoot," says I, "Is good. If your convention friend had been given a free hand he could have burst the gun in about 10 minutes shooting the bull."

Discuss Sand Testing

At the December meeting of the Quad City Foundrymen's association which was held Monday evening Dec. 22 at the Le Clair hotel Moline, Ill., H. W. Dietert, engineering department United States Radiator Corp., Detroit, explained the methods of testing the moisture, permeability and strength of molding sand as carried out and developed by his company. After the lecture these tests were demonstrated to the members present by the apparatus used by the U. S. Radiator Corp. It was shown that the tests were not only necessary with new sand, but are absolutely essential for the daily control of the sand used in the foundry. The speaker explained that the cost of the apparatus together with the cost of making the tests is paid for many times over in the saving of the castings, reducing the loss in many instances as high as 10 per cent and on an average at least 5 per cent. The tests pay for themselves not only in large foundries operating continuously but on floor and bench work in the same proportion.

Of the 428 testile machinery plants reporting to the department of commerce for 1923, 137 were located in Massachusetts, 70 in Pennsylvania, 56 in New Jersey, 51 in Rhode Island, 24 in New York, 17 in Connecticut, 14 in North Carolina, 13 in Georgia, and the remaining 46 in 15 other States.



THE ANCIENT AND HONORABLE GAME OF GOLF ILLUSTRATED—LIFTING ONE OUT OF A SAND TRAP

How and Why in Brass Founding

By Charles Vickers

Tells Method of Using Aluminum Solder

We would like the formula for aluminum solder, with full instructions for using it.

There are hundreds of different formulas used as solders for aluminum and the perfect one has not been discovered yet. The following alloy has a good reputation and is not difficult to make:

ALUMINUM SOLDER

	Per cent
Tin	73
Zinc	21
Lead	5
Phosphor tin	1

The difficulty encountered in soldering aluminum is caused by the film of oxide covering the surfaces. The same difficulty would be encountered with brass or any other metal, provided no *flux* was known to clean the metal surfaces to be joined. Chloride of zinc or some other similar flux has to be used when soldering brass. This flux removes the oxide from the metal allowing the molten solder to get into close contact with the metal. The oxide acts as the parting used on molds, and the solder fails to stick. The oxide film on aluminum cannot be removed by any well known flux long enough for the solder to come in contact with the metal, since the film forms as fast as removed. The usual way of soldering is to tin the surface by heating the aluminum, melting the solder on the surface to be joined and then scrubbing away the surface under the melted solder with a well soldered *iron* until the film is scratched off and the solder reaches the aluminum, when it will stick. After the two surfaces have been tinned in this manner, they may be united by pressing them together and melting the solder. A slight pressure must be maintained on the joint until it is perfectly solid.

Molder Swabbing Gates

We would like to know the cause of worm holes in brass castings made from scrap brass. Some are sound and others poured out of the same pot are full of holes. These show more especially around the gate, and some will not appear until the castings are machined. These particular castings are small rings.

If good and bad castings result from the same pot of metal, the latter cannot be at fault to any great extent, else all the castings would be bad from any particular heat. When metal is gassed, the gas is well distributed and it is not probable the gates on the casting will strain the gas out now and again, resulting in sound and unsound castings. Therefore, we think the trouble lies in the molding or in the sand.

As the holes have a tendency to cluster around the gate they may be caused by dampness at that point, and it is probable the molder is swabbing his gates. This is a bad practice, but it is by no means rare. It is customary in many cases for the molder, after liberally swabbing water around the gate to prevent *washing away*, to feel that he must not favor that particular spot, so he treats other parts of the mold in a generous fashion with water. If this swabbing is being practiced, provide kerosene instead of water. Also, seeing the metal is remelted scrap, it will be a good idea to treat it with 1½ ounces of phosphor copper, to each 100 pounds of metal.

Aluminum Castings Must Not Tarnish Easily

We are making aluminum castings for car fittings and want to use an alloy that will leave a fine, clean surface after they are buffed. In addition it must not tarnish readily. We have been told that an alloy with magnesium is particularly effective in producing castings that will not tarnish, and would like the formula for such an alloy.

It is doubtful if any aluminum alloy will resist oxidation for more than a short period. The magnesium alloy referred to in the query probably is as follows:

MIXTURE FOR MAGNESIUM ALLOY

	Per cent
Aluminum	95
50-50 Copper aluminum hardener	3
Magnesium	2

The magnesium is added last, and as the melting point of aluminum is 1218 degrees Fahr., and that of magnesium 1204 degrees, all that is required is to get the aluminum molten enough to be fluid. At this point it will dissolve the magnesium, as the latter is stirred in. Therefore, to alloy the magnesium there is no need of such stunts as fastening it to an iron rod, or putting it into a cup, the plunging it to the bottom of the aluminum, etc. The main thing is to keep the temperature of the aluminum at a reasonable point, when it will look silvery in color.

Hot Metal Produces Holes in Aluminum

We have been troubled by what seems to be air holes in the aluminum castings. After the objects have been buffed and polished the holes show badly, particularly on the heavier parts, and frequently they are so deep they cannot be removed by further polishing operations.

Usually difficulties of the kind described are caused by pouring the aluminum too hot. The problem to solve is getting the correct temperature of the metal to flow the castings fully and have them sound and free of the holes described. The only way we can see of doing this is to make a few experiments. It would be a great help if a pyrometer could be used, in fact it is of little use making such experiments without a pyrometer, since the same temperature could not be obtained twice in succession. We are unable to give the proper pouring temperature, since it depends on the thickness and size of the castings. It might be said that every aluminum casting is a law unto itself in the matter of pouring temperature. All aluminum alloy castings, no matter what their size and thickness, should be poured as cool as it is possible and get a complete casting. While the temperature to which the aluminum alloy is heated in the furnace, when within reason, appears to have nothing to do with producing the holes in the castings, provided the metal is cooled before it is put into the mold, it is nevertheless an exercise of common sense to use care and not to overheat one charge in the crucible, before making additions. It is common when melting in crucibles in a brass furnace to get the first portion, also subsequent portions of metal added about as hot as bronze, which practice is fraught with trouble and loss. Should there be any danger of forgetting the aluminum before additions are made, use a flux such as cryolite, or the aluminum fluxes advertised in THE FOUNDRY. Ordinarily aluminum does not require any flux, because it furnishes its own in the shape of a tough film of oxide, also it does not take up the same gases as copper and its alloys. According to experiments made by the writer at a certain temperature it appears to decompose the moisture in the sand of the mold, and the liberated hydrogen diffuses throughout the aluminum and being held, produces these holes.

Producing Deaerator Shells

Production Methods Employed Involve the Use of the Slip Ring Thus Eliminating the Necessity for Sweeps or Solid Patterns—Device Used To Purify Water for Use in Metallic Containers

BY JAMES J. ZIMMERMAN

DEAERATION is a process through which water is passed for the purpose of eliminating certain agents which actively produce corrosion and which eat and destroy pipe lines, boilers, economizers or other containers of water. The principal objective of this article is to explain the foundry practice employed in the rapid production of shells, such as are used in building the component parts of a deaerator. However, inasmuch as the principle of deaeration is of comparatively recent origin, a discussion of the process may serve to point out the recent developments along the lines of power plant engineering.

In a number of attemps to prevent corrosion, the use of metals, both ferrous and nonferrous, have been advocated, which supposedly are resistant to corrosion, but which have been make-shifts, for in their making and use, the fundamental steps in the solution of the problem have been ignored. namely, the finding and the elimination of the cause of metal corrosion.

The author is planner, the Elliott Co., Jeanette, Pa.

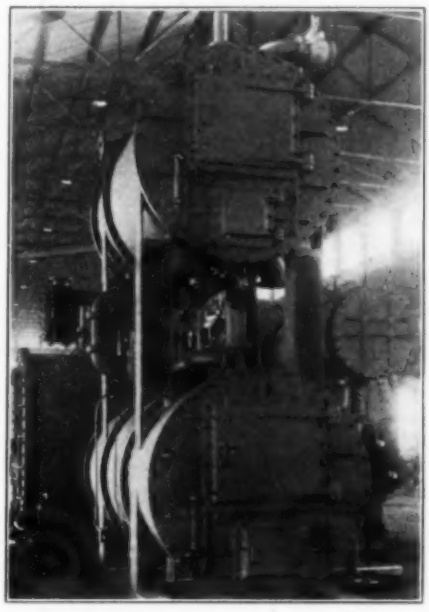


FIG. 2—LARGE SHELLS ARE REQUIRED IN BUILDING THE DEAERATOR

It has been demonstrated that water alone will not cause corrosion. However where any metal, except gold, silver or platinum, comes in contact with oxygen and water, corrosion occurs. This is the key to the solution of the problem, for corrosion stops, if oxygen is removed together with other gases dissolved or contained in the water unless the water is excessively acidulous. In this event the cutting caused by the combined efforts of the acid, oxygen, and dissolved gases will be reduced to about 20 per cent of what it would have been without having passed the water through the process of deaeration.

Several deaerator units completely assembled are shown in Figs 1 and 2, each consisting of a heater, a separator, and several condensers, wherein the water is heated and passed into a region of vacuum in which it boils violently, and liberates the dissolved gases and oxygen. These gases are withdrawn by an ejector, or an air pump, and are discharged into the atmosphere, while the water which has been deaerated remains at the bottom of the lower shell where it is avail-

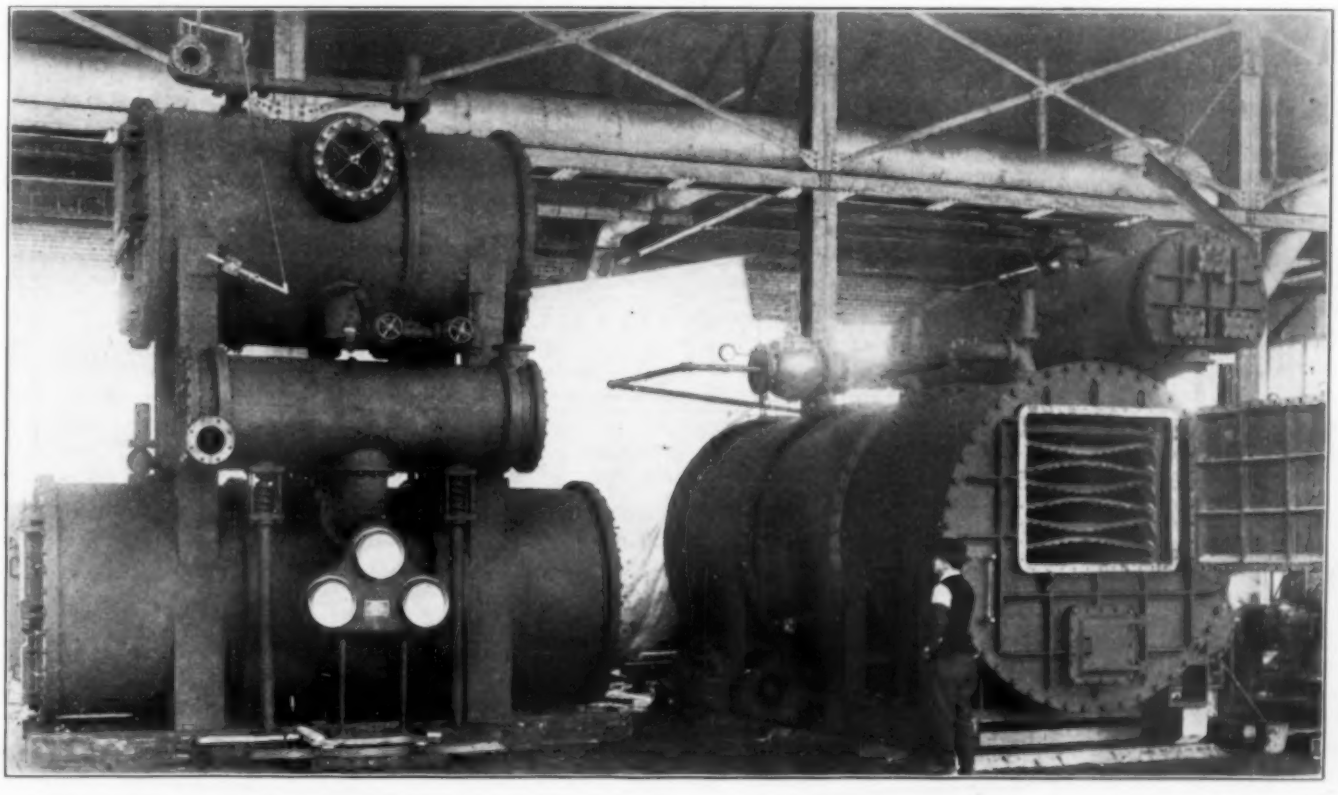


FIG. 1—THE DEAERATOR UNIT CONSISTS OF A HEATER, SEPARATOR AND SEVERAL CONDENSERS

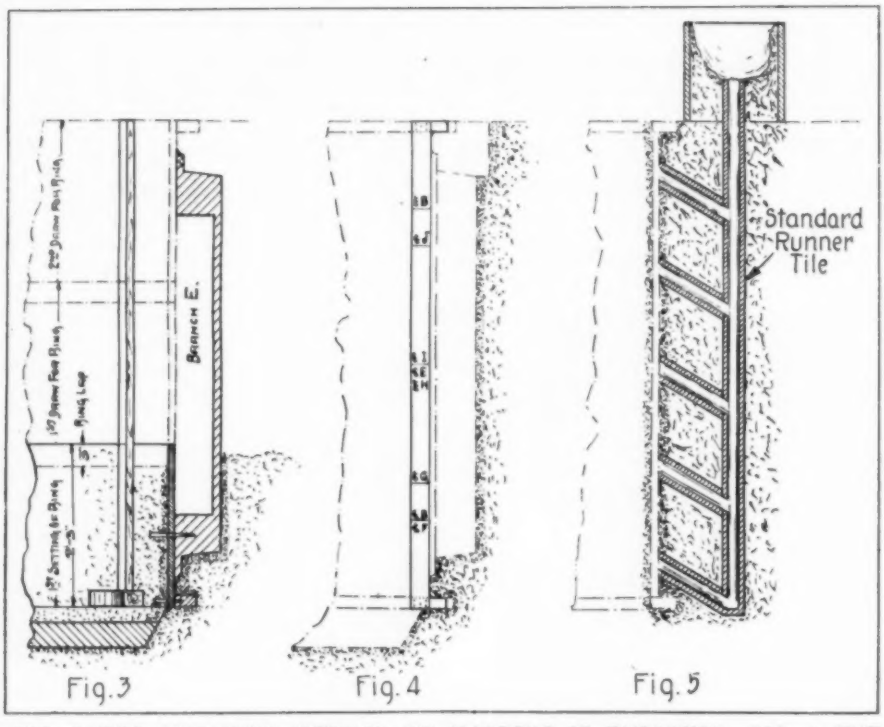


FIG. 3—THE SLIP RING METHOD OF MOLDING IS EMPLOYED FIG. 4—THE CHEEK IS CHECKED WITH A CHECKING GAGE FIG. 5—A SPECIAL METHOD OF GATING IS USED

able for use in heating systems, in boilers, or for other purposes.

Shells for these units vary according to the capacity of the units, and run from 36 to 108 inches in diameter with a sectional thickness of from 5/8 to 1-1/4 inch, depending upon the pressure which is existing within the units when they are working. The weights of these shells vary from about 1000 to about 13,000 pounds and require from 20 to 70 molders' hours for production.

Adopt Slip Ring Method

Experience has taught that this class of shell may be made in loam molds with sweeps, or from solid patterns, but the rapid production necessary for this work soon made these methods obsolete, and caused the method of using a slip ring pattern to be adopted as the most rapid and successful.

A shell 84 inches in diameter and 6 feet in length, with a sectional thickness of 1-1/8 inch is shown in Fig. 6. The connection pads, nozzles, and feet are shown with their respective core prints, *E*, *F* and *H* indicated by light thin lines. It will be noted that the equipment necessary for making the mold is shown by dot and dash lines, and further that the entire casting has been molded in an upright position, and in a pit.

The first molding operation is to excavate the pit and to make bottom, then to place the core lifting plates *W* in place, and to ram up around it until the sand reaches the line of the lower flange of the casting *X* making sure that a good parting is made between the core and the cheek along the line of parting. The core lifting bolts, *O* are fitted through the lifting plates and secured at the bottom by means of tapered wedges.

Upon this flat bottom, the machined cast iron pattern ring 1⅛ inches thick, with an inside diameter of 7 feet and a height of 27 inches is placed and leveled up. The wooden gage sticks shown in Fig. 4 are placed within and against the inside diameter of the ring. These gage sticks are marked with lines at the different heights to which the pattern ring is drawn upward while molding the shell. While in the position of the first setting, the pads *E*, *F*, *G* and feet *B*, and lower flange segments *X* are pinned from the inside on the ring, according to the location markings indicated on same by the pattern shop.

The sand is rammed around and about these pads after which the pins are withdrawn, thus permitting the pattern ring to be drawn upwards with the pad remaining in its rammed up position in the sand. The core, or the inside area of the pattern ring, is rammed up for a distance of a few inches, and the large cast iron cone *S* is set. This cone eliminates a large amount of sand ramming, and also does away with the necessity of a soft center coke filled core to care for contraction of the metal after pouring, as will inevitably take place during cooling, thus eliminating the chances of the shell cracking. It further does away with screening the sand which will become mixed with coke when soft centered cores are used.

Having completed ramming the sand during the first setting of the pattern ring, the ring is pulled upward until the top surface of it comes in line with the marks for the first draw on the gage sticks, and the same operations of pinning the pads to the rings

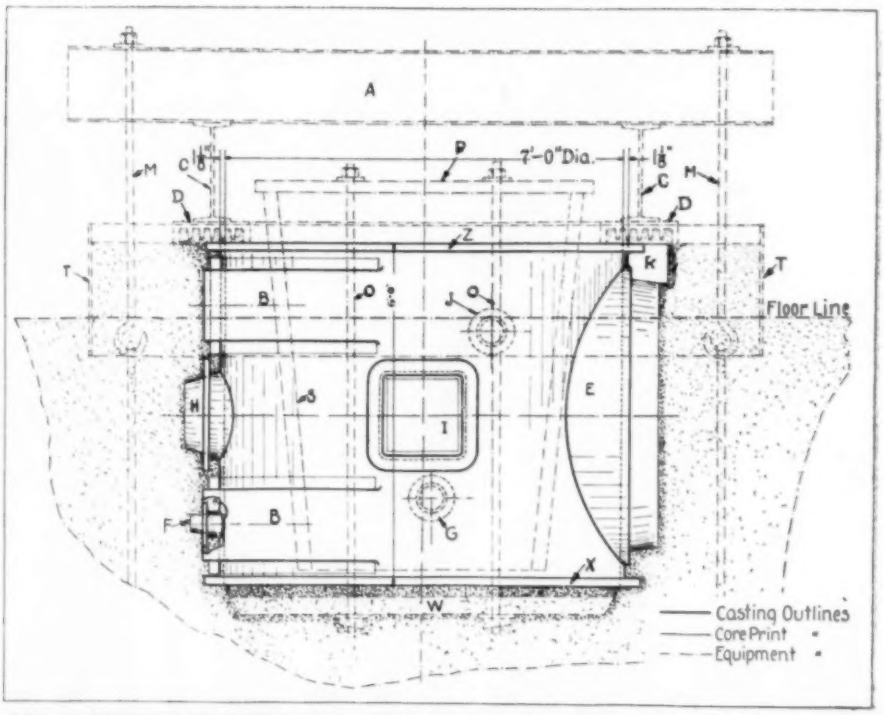


FIG. 6—SKETCH SHOWING THE METHOD OF MOLDING THE SHELL AND ALSO SHOWING THE CORE PRINTS

and the ramming of the cheek and the core are carried out.

Next, the ring is drawn upward to the top of the gage stick, as is the case in molding this particular shell, and the pads within this range of draw as well as the top flange segments *Z* are pinned to it, and the cheek and core are rammed as before, after which the pattern ring is entirely withdrawn from the mold.

The lifting spider *P* next is placed on the top of the cast iron cone *S* with the lifting bolts *O* passing through it, and by means of this lifting plate the core is withdrawn from the mold, after which it is dressed and placed in large core ovens for drying.

The branches and flanges which are imbedded in the cheeks of the mold then are picked out and the cheek is dressed, properly and checked by a checking gage, as shown in Fig. 4. By this means the location of the various pads and branches are checked according to their center lines. After the check of the mold has been checked properly, a salamander containing glowing coke is placed within it and at the bottom, and the entire cheek is covered over and allowed to dry.

The mold is poured simultaneously from runners on opposite sides of the mold, which are made from standard tiles, as shown in Fig. 5 and are rammed up when the mold is being made. These runners not only rise from the the gate to the metal as is shown in the illustration, but swing out of the plane which would be produced by an imaginary sheet between the center of the mold and the center of the vertical gate. In this manner a more rapid pouring of the metal may be accomplished without danger of destroying the facing of the core by a cutting action of the metal. A swirling motion is produced in the metal as it is poured, which has a tendency to force any sand, dross, or particle which may be loose in the mold to the top, where it will collect either in the risers of gates, or at the extreme top of the flanges, which are left sufficiently thick for machining off any spongy metal which may be located at the surface.

The core for the feet, nozzles, branches, and other parts of the mold are made according to standard practice, and are baked as is the cover plate *D* which is simply a flat ring sufficiently wide to cover the top flange of the mold, with two flanges projecting downward from it, and numerous projections for holding the loam. This rig usually is swept from loam by use of a sweeping spindle, such as is found in almost every shop, and insures a flat and even surface.

The core *K* shown in Fig. 6 is a black core necessary to form the top of the pad *E*, and the flange *Z* and presents nothing beyond ordinary practice.

To facilitate pouring of the shells it has been found desirable to have the top of the mold somewhat above the shop floor-line and this has been accomplished by using standard piling sections *C* Fig. 6 cut in lengths of about 18 inches. Flexibility has been obtained by using this piling for this part of the mold which would be impossible if flasks were used, for when these piling sections are linked together, molds of different diameters may be built according to the diameter of the shells being cast.

After the core and the cheek have been properly dried, the entire mold is cored and tied together by beams *A* and *C* and the holding down bolts *M* and the pouring basin boxes as shown in Fig. 5 are placed in position, and the entire mold is made ready for pouring.

After the mold has been poured, and the metal has set, the rigging is torn off and the cone *S* is removed to allow for the cooling shrinkage of the shell. When the shell has cooled sufficiently to permit its removal from the mold, a trench is dug around the outside and the entire shell is pulled out, leaving the core lifting plates remaining at the bottom.

This method of casting the shells in a pit, rather than on the floor and in flasks, has been found to be quick and cheap, so that after a short period of instruction, the cheaper grade of labor may be used with results which seem just as good as obtained with the highest possible type of molder.

Action of Manganese in Cupola Mixture

By George A. Drysdale

Question: We would like to know how large an amount of manganese we may safely use in our cupola mixture and how thin a plate may be poured from such a mixture. Is it more satisfactory to make the manganese mixture in the cupola or in the ladle?

Answer: The amount of manganese that you may safely use in a cupola mixture, and the thinnest plate that you will be able to pour from such a mixture, will depend in a great measure on the condition of the mold at time of pouring, in other words, if the mold is green sand, skin dried or baked. Manganese when used in the higher proportions in an iron mixture from 1.25 to 1.75 per cent has a tendency to produce hardness and surface chills, especially in castings having a thin section.

As you have not stated the condition of the mold, we will assume it to be baked as such would be the most favorable to thin castings. The accompanying approximate figures covering silicon, phosphorus, manganese and thickness of casting (depending upon proper gating of the mold) should give satisfactory results.

Thickness of plate inches	Per Cent— Silicon	Phosphorus	Manganese
⅛	3.25	1.25	0.50
¼	3.00	1.00	0.75
½	2.50	0.75	1.00
1	2.00	0.50	1.50

Silicon softens, phosphorus aids the flow and manganese toughens the metal.

We assume you wish to make a casting as thin as possible and yet strong, tough and free from surface chills which is rather a difficult problem. You will notice by the accompanying figures that the amount of manganese used will be in proportion to the thickness of the plate.

The most satisfactory way to add manganese to the iron mixture is in the form of high manganese pig iron (manganese 2.00 to 2.50 per cent) melted in the furnace. However, if you require only a small amount of this special iron, it may be added in the form of ferromanganese to the molten iron in the ladle.

Founding Limited in Mexico

(*Concluded from Page 69*)

go in and come out. If you drive up in your car, he throws open the gate and gives you *paso libre;* but if you go afoot and he does not know you, he may ask you where you are going and what is your business.

To sum it up, the field covered by the brass foundries in Mexico at present is limited and not large enough to justify one in dividing it up and trying to be a specialist in any particular line. The few of us who have tried to separate ourselves from the iron and steel foundries and give our attention to brass, bronze, copper and aluminum casting, have to take all kinds of jobs that are offered to keep busy and hold our organizations together.

We know that Mexico is one of the richest undeveloped countries in the world and we know what can be done if it ever settles down and really goes to work. We still believe that this will actually happen some time, and when it does, we figure on being here and in on the ground floor. In the meantime, we are doing what we can to make the best of the immediate present.

Patternmaker Utilizes Bench

Top Made of Six Pieces of Maple Doweled and Glued Together—Vise Is Important Part of Benchworkers' Equipment—Stops Keep the Work from Slipping When Planing

BY WALTER C. EWALT

PATTERNMAKERS working in wood often are called benchworkers, since most of the work, comprising laying out and assemblying the pieces of wood which make up the pattern, is accomplished on the bench. A good type bench for use by patternmakers is shown in Fig. 1 of the accompanying illustrations. The front part of the top of the bench consists of six, 4 x 4-inch, clear kiln-dried, hard maple pieces dressed to 3½-inch square and doweled and glued together as shown in section A-B. A dove tail tongue is made at each end of the bench top to which is glued an end piece called a bolster, which has a dovetailed groove worked out of it as shown in section C-D. The bolster is made longer than the maple top by the width of the board at the recess, plus the thickness of the back. The dovetail grove of the bolster should extend only as far back from the front as the width of the maple top. The under part of the bolster is rabbitted out about 1½-inches to receive the end of the board at the recess, the back board and bolster being dovetailed at the ends. Bolts are used, as shown in the illustration, to connect the top with the bolsters. Cast-iron legs are used. This type of construction makes a firm, solid bench on which to work.

A stop is used to prevent the work from slipping when being planed, the adjustable type, shown in Fig. 1, being preferable. The stop may be let down flush with the top of the bench. A simple stop is shown in Fig. 5 which may be made of 1-inch square iron, 9 inches long with a spring attached which causes the stop to remain in any position as it is raised and lowered. A square hole is mortised in the top of the bench to receive the stop. This type of stop has been in use for a long time, and is entirely satisfactory. A new bench should be given a couple of coats of linseed oil. After the oil has dried, the bench should be given three coats of shellac.

Top Should Be Plane

The top of the bench should be a true plane, and the workman should have pride in keeping his bench free from hammer marks, scars, cuts and marks from other tools. An iron surface plate, as shown in Fig. 2, is a great help to the patternmaker. A number of uses may be found for this type of plate, for example enabling the patternmaker readily to see if the work is planed true, a means of squaring work by edges, a base for surface gage, etc. It also may be used to advantage in gluing pieces, since glue will not stick to the iron. The edge making the 90 degree angle may be used as a guide for the surface gage to draw parallel lines. Straight or curved work may be laid out as shown in Fig. 3 on top of the plate.

Bevels may be drawn out on the plate using the edge for the head or beam of the bevel. With the blade resting on the top surface, permanent scale lines are drawn on the surface such as ¾ inch to 1 foot, 2, 5, 10, degrees, etc. The bevel may be adjusted quickly to the angle wanted without recourse to the protractor each time. An adjustable stop may be fastened to the edge of the surface plate, to plane thin pieces of wood.

The board at the back of the bench

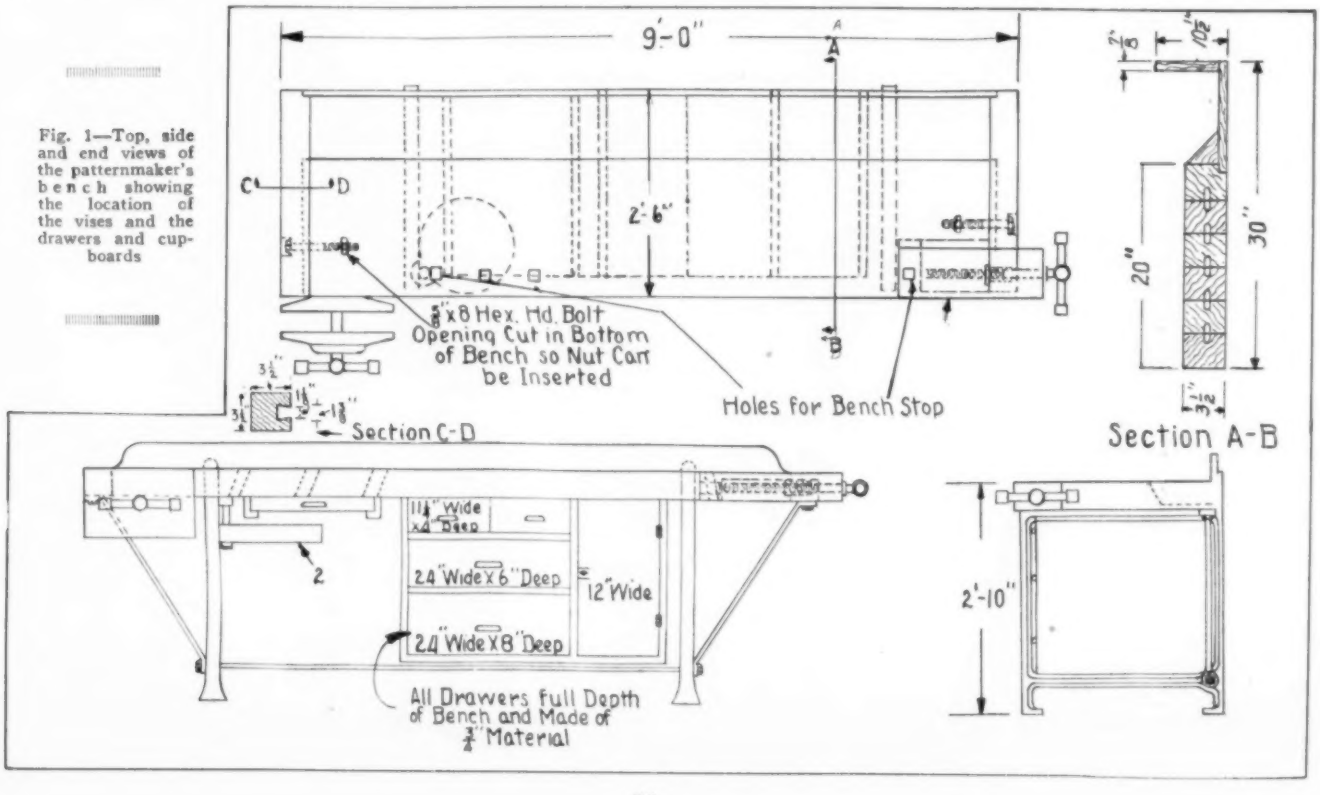


Fig. 1—Top, side and end views of the patternmaker's bench showing the location of the vises and the drawers and cupboards

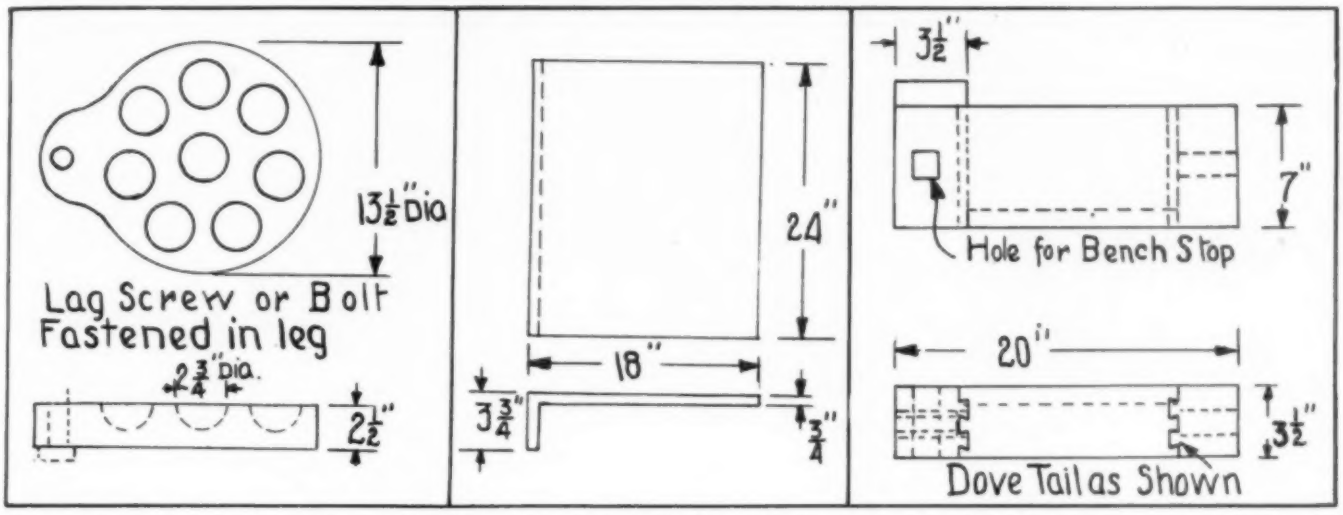


FIG. 2—LEFT—SWINGING BRAD TRAY HELD UP BY LAG SCREWS—CENTER—AN IRON SURFACE PLATE IS A GREAT HELP TO THE WORKER—RIGHT—HOLES ARE CUT FOR THE BENCH STOPS

provides a convenient place for numerous tools such as chisels, gages, nail sets, etc. Holes bored in the top edge of the board permit the storage of augers, drills, etc., in a handy position. Such tools as planers, hammers, etc., are kept out of the way of moving work. As a general rule, it is noticed that the man having a definite place for his tools and who keeps his bench reasonably clean, with tools not in use in the proper place, is a faster worker because a minimum amount of time is spent in looking for tools.

A bench hook is a home made tool, as shown in Fig. 4. It is used when sawing, chiseling or planing small pieces of wood, a process which often is quicker than walking to the band saw or planer. A series of cuts may be made on the shoulders which are used as guides when using a dovetail or backsaw. When planing the ends of small pieces of wood, the piece is placed against the shoulder slightly beyond the side of the bench hook. A truer surface may be made this way than by planing the wood in a vise as there is not so much danger of planing at an angle. The bench hook may be made of a piece of 2-inch pine and sawed out with a bandsaw. A hole is bored in one end for hanging on a nail.

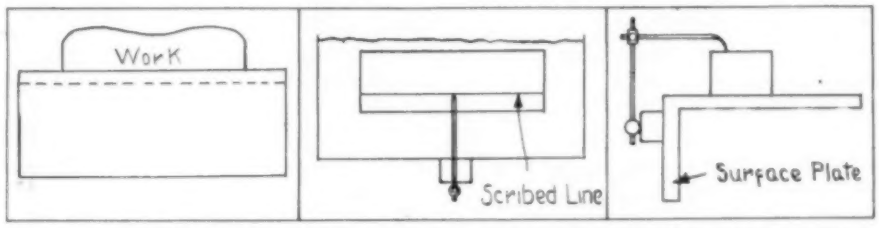


FIG. 3—THE IRON PLATE MAY BE USED FOR TRUING WORK, FOR SCRIBING PARALLEL LINES AND FOR LAYING OUT CURVED WORK

The vise probably is the most used part of the patternmaker's equipment. It is used to hold the wood when planing, chiseling, carving and for many other operations, especially where it is necessary for the worker to use both hands. Since it is used so extensively, the best type should be obtained. The latter also applies to all paternmaker's tools, for the best are the cheapest in the end. An iron vise is made in two styles, the quick acting vise with the advantage of fast adjustment being shown in Fig. 7. There are various styles of quick acting vises, one of which, by slightly turning the handle to the left until it comes to a stop, the front jaw of the vise may travel forward and backward the length

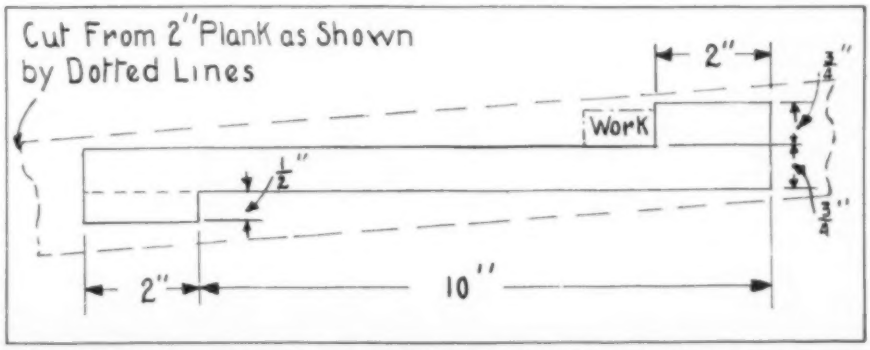


FIG. 4—A BENCH HOOK IS AN ESSENTIAL PART OF THE WORKER'S EQUIPMENT—THE TOOL IS MADE BY THE PATTERNMAKER

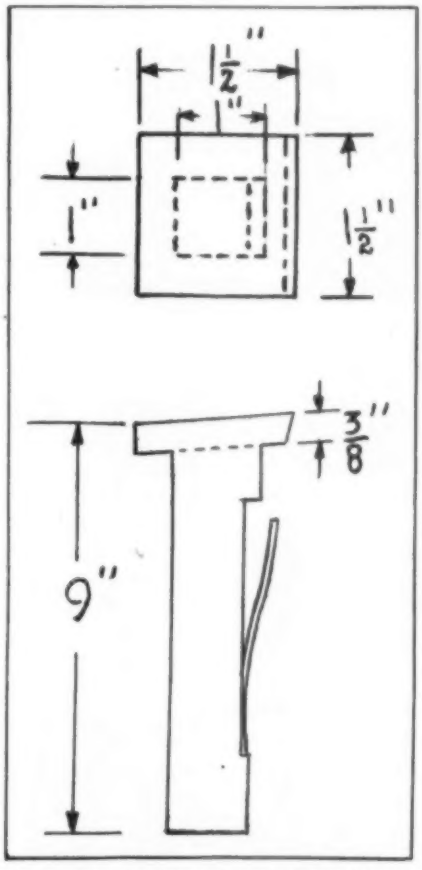
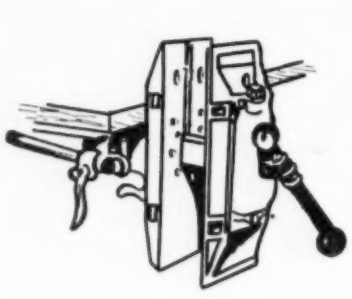


FIG. 5—THE METHOD OF MAKING THE STOP IS SHOWN



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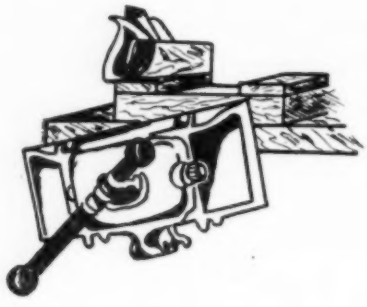

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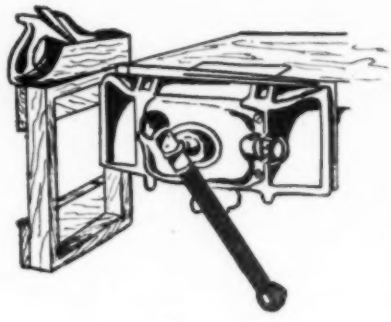

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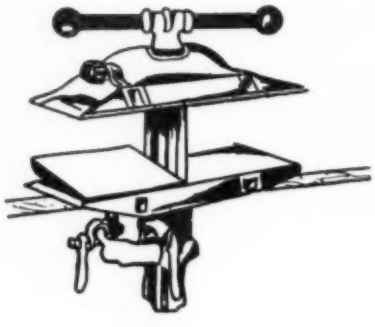

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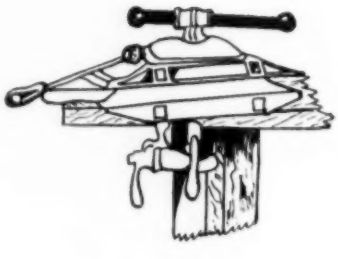

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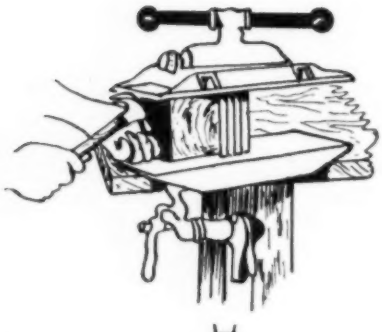

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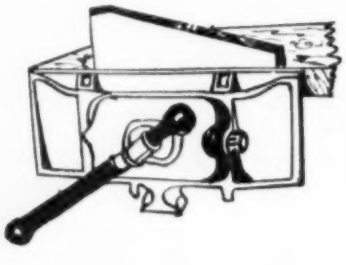
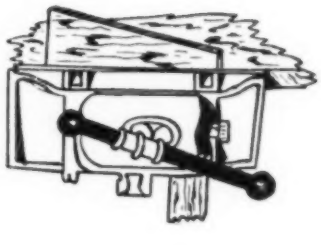


J

FIG. 6—PATTERNMAKER'S VISE WHICH MAY BE TURNED TO VARIOUS ANGLES TO MEET WORKING CONDITIONS—*A* JAWS VERTICAL—*B* LOCKED AT AN ANGLE BETWEEN VERTICAL AND HORIZONTAL—*C* JAWS VERTICAL, POSSIBILITIES OF CLAMPING WIDE BOARD SHOWN—*D* STOP IN USE—*E*, *F*, *G* AND *H* VISE MOVING IN ANOTHER CIRCLE—*I* USING STEEL FACE JAWS—*J* JAWS SET AT AN ANGLE—*K* JAWS HORIZONTAL



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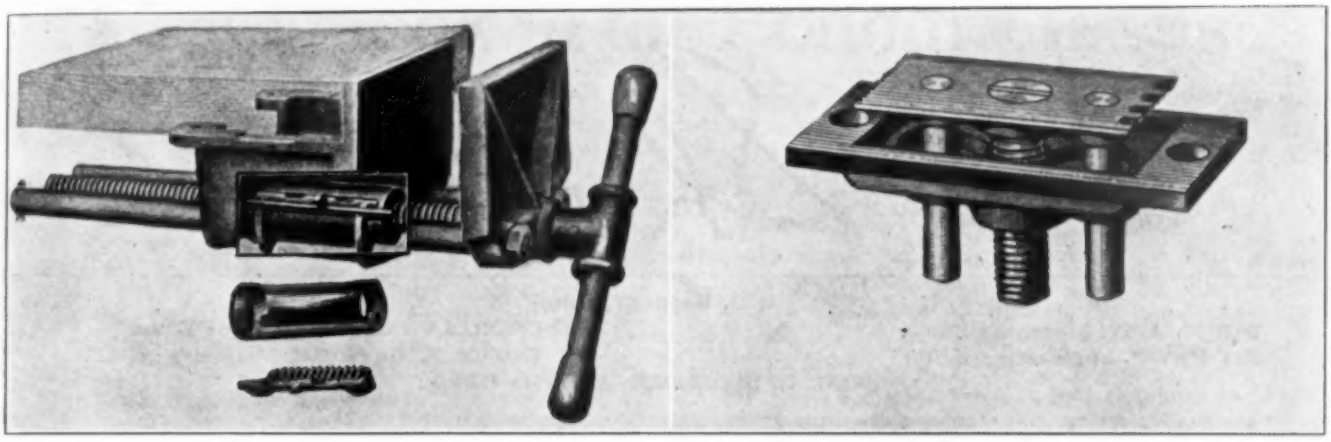


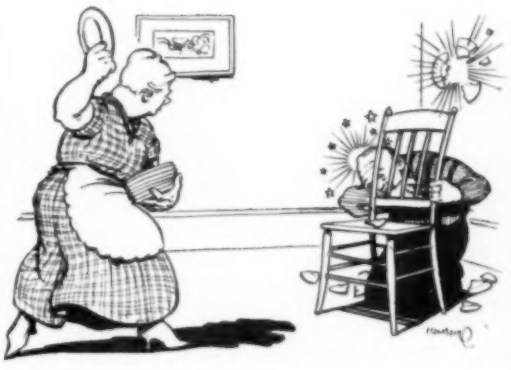
FIG. 7—WITH THE QUICK ACTING VISE FAST ADJUSTMENT MAY BE MADE FIG. 8—A SPECIAL METAL STOP MAY BE USED

of the screw. In case the wood is placed between the jaws against the back jaw and the front jaw is moved forward to the wood, a slight turn of the vise handle to right clamps the wood.

Another style, which is adapted well to the patternmaker's use, is shown in Fig. 6. This vise has seven pairs of jaws, any pair of which may be adjusted quickly to the position required by the patternmaker for holding irregular shapes. Its normal position is shown at the side of the bench, Fig. 66 *K*. By unlocking, the jaws are swung into a vertical position, *A*, Fig. 6. In *B* it is shown locked at some angle of the arc. The normal position is shown in *C* and the possibilities of clamping a wide board, due to the wide jaws, are indicated. Fig. 6 *D* shows one of the uses of the stops. By tripping a trigger the vise moves in another circle of 90 degrees, but at right angles to the former circle, as shown in *E*. *F*. *G*. and *H*. at any point of the 90 degrees it will swing 180 degrees. When raised to the horizontal position, the vise will swing through the complete arc of a circle. The use of steel faced jaws is shown in *I*, while the jaws set at an angle to hold wedge shaped pieces is shown at *J*. Fig 6 shows that this vise takes the place of many vises in different positions. No matter what shape of wood is used, the patternmaker may work on it comfortably because he moves the work where convenient instead of bending or twisting to suit conditions. At the right end of the bench, Fig. 1, another vise is located which is used principally to hold or clamp a board between its step and the stop which is put in the holes in the top of the bench, or it may be used in clamping in the same manner pieces to be glued. These stops, as shown in Fig. 5, are flush with the top of the bench when not in use. The holes for the stops are cut at a slight angle, since the back of the holes will wear and compress in time. If cut square with the top of the bench, the pressing and clamping of boards eventually will tip the stop and cause the board to spring away from the top of the bench at the center, thus making it harder to plane or clamp for gluing.

At the extreme left hand and under the top of the bench is a board held up with angle irons. The board may be slid out for use. This board will be found convenient for jobs which may be worked on in a sitting position, such as backing out plaster coreboxes and other small work. The board is 3½ inches lower than the bench. Under this is a swinging brad tray, Fig. 2, which is held up by a lag screw fastened to the under side of the top. This will be found to be a convenient location since most of the work is done around the left side of the bench. Below the top of the bench are drawers, two small and two larger ones, as well as a cupboard. These drawers and the cupboard will be found large enough to accommodate a sufficient kit of hand tools and equipment. The tools should be kept in an orderly manner, each tool having its individual place. The bench should be placed in such a position that the workmen will have the best light for his work. In many shops the benches are placed with the left end of the bench toward the windows, while in others the back is placed against the window. A strong table, 4 feet square and 26 inches high, should be placed 3 or 4 feet in front of the bench on which the patternmaker may lay out large work and on which to build patterns.

Faked Foundry Facts



Plates

Locality Fixes Value

Question: I am forwarding a sample of white sand taken from a considerable deposit which I control in this vicinity and will appreciate your opinion on its value in the foundry industry.

Answer: Sand, with and without bond, suitable for foundry use is scattered so broadly over this country that the commercial value of any deposit depends on its location in relation to the foundry centers. Sand, like every other commodity is on a competitive basis and the market depends on the freight rates. The sample submitted has no particular merit and in fact is not up to the usual standard required either for steel foundry use or for sandblasting. It would serve for making cores for small iron or brass castings, or for parting sand, but in your territory the consumption of sand for those purposes would not amount to any great extent and therefore in our opinion your sand deposit hardly can be regarded as an asset.

The Shakeout

A. O. BACKERT, Editor

DAN M. AVEY, Managing Editor
PAT DWYER, Engineering Editor
CHARLES VICKERS, Nonferrous Editor
GEORGE A. DRYSDALE, Metallurgical Editor
FRANK G. STEINEBACH, Associate Editor

¶ Watch For Opportunity

OPPORTUNITY knocks once on every man's door. Sometimes the man is away from home. At other times he is asleep and occasionally he is tired or thinks he is too busy to walk to the door to find out who is seeking admission. In a comparatively few instances he is waiting inside, close to the door, with both ears cocked and with all 10 nails sharpened, ready to welcome the knocker, drag him inside and put him to work.

At least one prominent brass foundryman in the East is in the class that recognizes opportunity at the first knock.

Among the many castings which he handles is a highly complicated device made almost entirely in cores. The making of these cores entailed a great deal of time on the part of skilled coremakers and constituted a heavy labor charge against the job.

COMPETITION among several foundries in the district had reduced the profit on this particular line of castings to the vanishing point. The same methods were employed in every shop.

The foundryman turned the problem inside out and upside down but he was as far ahead at the end as he was at the beginning. Then he attended the convention of the American Foundrymen's association in Milwaukee and yelled Eureka. He saw a coremaking machine which in the expressive language of the day was just what the doctor ordered.

In his capacity of medical adviser to his own business he ordered a machine to be shipped immediately to his plant. Upon his return he contracted for all the castings required in the vicinity for a year at a price that none of his competitors could meet and yet one calculated to yield him a profit after the cost of the machine has been absorbed.

¶ Sand Tests Applied

TREND of thought toward closer co-operation between the various interests engaged both directly and indirectly in the production of castings is illustrated in the recent action of a prominent molding machine manufacturer that has carried on an extensive series of tests on samples of sand secured from various localities in different states of the union.

Foundrymen generally are aware that sand varies in composition and this characteristic not only applies to sands taken from individual and separated deposits, but also in some cases and to some extent between samples taken from the same sand bank.

PERMEABILITY, bond, grain size and moisture content all bear a direct ratio to the density to which sand may be rammed and this factor in turn is reflected in the operation of the molding machine. A certain squeezing pressure or a definite number of jolts yielding satisfactory service with one kind of sand, presumably might yield anything but satisfactory results with another sand.

THE experimental work is in line with that carried on under the auspices of the American Foundrymen's association and is designed for the benefit of practical foundrymen who want a ready and accurate method of determining whether a sand is adapted to their particular purpose. It takes the place of the old shop test where a molder squeezed a ball of sand in his hand and then judged the bond and other features by its appearance.

EXPERIENCE over a long period of years and under widely varying conditions was required before a foundryman was in a position to apply this test intelligently. The new test furnishes the same information mechanically, accurately and to a more extended degree and may be applied by a person without former foundry training. The movement marks the yielding of one of the old fortresses of foundry tradition to the modern light of scientific progress that wants nothing but the truth.

¶ Encroach on Casting Field

MANUFACTURERS of pressed steel products are making constant progress toward supplanting certain types of castings with materials of their own manufacture. While a few years ago the pressed metal industry was devoted almost entirely to the production of parts for automobiles, the war period with its exceptionally heavy demand on the foundry industry necessitated rapid development in fields capable of relieving the excess load on the casting capacity of the country. Pressed metal presented possibilities in this direction and many stampings were designed and produced for the ordnance department as replacements for castings. Since the close of the war the manufacturers of pressed metal have been constantly on the alert, designing parts which may be substituted for castings or redesigning entire assemblies to permit the use of pressed steel instead of castings.

Trade Outlook in the Foundry Industry

WHILE the orders for castings have not been increased to a marked degree during January, those basic industries which contribute more directly to castings demand have been increasingly busy. Steel production is mounting steadily, railway purchases and inquiries continue, the automotive lines are planning increased production schedules, the outlook for building activity is bright and municipal projects are expanding. Despite this condition, foundry activities are satisfactory, viewed in comparison with the state of castings business during the late summer and fall. No pessimism is felt nor expressed concerning the outlook among either specialty or jobbing shops.

Farmer Is Stirring

Forecasts prepared from summaries gathered by the National Association of Farm Equipment Manufacturers point to increased buying from the rural districts during 1925. For the past four years, the farmer has been a negligible factor in many markets. His purchases of farm implements have been limited by the most extreme necessity. Now that his buying power is supported by increasing prices, the measure of necessity will be extended. His purchases of implements, it is thought, will increase greatly. Further, the consumption of other products, many having a direct bearing upon the market for castings, will increase in kind. A. E. McKinstry, vice president of the International Harvester Co., Chicago, states that in addition to the growth in buying power, implement demand will be aided by the urgent need for implements for replacement and the scarcity and high price of farm labor. Reductions in the prices of farm implements will furnish an added inducement. Another factor that will enhance the value of farm demand in its effect upon castings sales is the wider application of electrical power to farm labor and domestic requirements.

Prices for Raw Materials for Foundry Use

CORRECTED TO JAN. 7

Iron		Scrap	
No. 2 foundry, Valley	$22.00 to 23.00	Heavy melting steel, Valley	$21.00 to 21.50
No. 2 southern, Birmingham	20.00 to 20.50	Heavy melting steel, Pitts.	22.00 to 22.50
No. 2 foundry, Chicago	24.00 to 24.50	Heavy melting steel, Chicago	19.50 to 20.00
No. 2 foundry, Philadelphia	24.63 to 25.26	Stove plate, Chicago	19.00 to 19.50
No. 2 foundry, Buffalo	23.00	No. 1 cast, Chicago	22.00 to 22.50
Basic, Valley	21.50 to 22.00	No. 1 cast, Philadelphia	20.00 to 21.00
Basic, Buffalo	23.00	No. 1 cast, Birmingham	17.00 to 17.50
Malleable, Chicago	24.00 to 24.50	No. 1 cast, Buffalo	18.25 to 18.75
Malleable, Buffalo	23.00	Car wheels, iron, Pittsburgh	20.50 to 21.00
Coke		Car wheels, iron, Chicago	22.00 to 22.50
Connellsville foundry, coke	$4.75 to 6.00	Railroad malleable, Chicago	21.00 to 21.50
Wise County foundry, coke	4.50 to 5.00	Agricultural, mal., Chicago	18.50 to 19.00
		Malleable, Buffalo	20.00 to 21.00

Iron Output Increases

According to statistics compiled by the *Iron Trade Review*, the advance in pig iron production during December was marked. A total of 2,961,067 gross tons is credited to the last month of 1924, compared with 2,514,979 tons in November. This marks a gain of 446,088 tons. December was the fifth month to show a marked gain, since increasing activity in steel mill and general manufacturing lines has brought about a growth in pig iron consumption. On a daily average basis, the increase is even more pronounced. December showed a daily production of 95,518 tons, giving a gain of 11,686 tons per day, compared with the preceding month. Merchant iron totaled 646,663 tons in December, giving a gain of 41,225 tons over November. An average of 20,860 tons per day of merchant iron was produced in December, compared with 20,181 tons in November. The steady advance is reflected in the number of blast furnaces which are active. On Nov. 30, a total of 204 furnaces were operating, while on Dec. 31, this had increased to 229 stacks in blast. Two more merchant furnaces were making iron at the close of December than on Nov. 30.

Factors Favorable

The close of 1924 found railway car buying active, and this condition has continued well into January. Awards for the first week of 1925 totaled about 9000 cars. This follows along with the tendency at the close of the preceding years, December having shown a total of over 18,000, while the year's orders had run well over 140,000 units. The automobile industry has been operating with caution during the winter. Remembrance of the calamities following the accumulation of large inventories of stock and cars, has induced caution. The November production of 222,127 passenger cars and trucks represented a 23 per cent decline, compared with October, and was actually the smallest total since September, 1922. With general industry improving, reductions in prices and the stimulating effect of the automobile show season, manufacturers are expecting an early advance in sales. Stove foundries continue to operate at a fair rate, while slight improvement is noted in the demand for sanitary ware, induced by the low level of jobbers stocks. Malleable foundry operation is better in early January, except in the case of shops depending largely upon automotive castings. November, according to the department of commerce showed a slight recession. The total production of 141 plants reporting showed 47,981 tons on a rated capacity of 113,011 tons, giving 42.5 per cent as the rate of operation. This may be compared with 43.8 per cent for October and 36.9 per cent for September. Coal consumption which furnishes a yardstick for all industrial activity showed an increase of 10 per cent during November, according to the National Association of Purchasing Agents. Of all the industrial firms reporting stocks and consumption of coal to this association, 72 per cent showed an increase, 17 per cent reported that they had used about the same amount.

Nonferrous Prospects

Brass foundries are optimistic. The prospects for increased building activity, the large railway requirements and the outlook for automobile production point to better demand. New York prices on nonferrous metals, according to the *Daily Metal Trade* of Dec. 7, follow: Casting copper, 14.50c; electrolytic copper, 14.95c; Straits tin, 59.75c; lead, 10.50c; antimony, 17.87½c; nickel, 38.00c; aluminum, No. 12 alloy, remelt, 22.00c to 22.50c. Zinc is 7.85c, E. St. Louis, Ill. Average monthly prices for December follow:

New York Prices

Castings Copper	Electrolytic Copper	Lead	Tin Straits	Antimony	Aluminum 98-99	Zinc St. Louis
13.991	14.533	9.669	56.175	14.976	27.00	7.376

Comings and Goings of Foundrymen

ALBERT SHEPHERD who has been with the Hill & Griffith Co. Cincinnati, foundry supplies, has accepted a foundry position with the Advance Rumely Co. Battle Creek, Mich. Mr. Shepherd served his apprenticeship under his father in one of the largest foundries in Yorkshire, England. He migrated to Canada 16 years ago. His first position in the new world was with the Welland Machine & Foundries, Welland, Canada, where after working as a molder for one year his executive ability was recognized and he was advanced to foundry foreman. When war was declared between Great Britain and Germany he was transferred to Winnipeg to take charge of the Manitoba Bridge & Iron Works. After completing his work in Winnipeg he came to the United States and took charge of a foundry at Tecumseh, Mich., making emergency fleet castings. Mr. Shepherd then entered the employ of the Advance Pump Co., Battle Creek, Mich., to start their new foundry on a working basis after which he became associated with the Hill & Griffith Co.

Charles Anderson, secretary and treasurer as well as general manager of the Belle City Malleable Iron Co., Racine, Wis., has been elected president of the Racine association of commerce.

A. G. Agnew has resigned his position as vice president of the Waterloo Bank & Trust Co., Waterloo, Iowa to assume his new duties as treasurer of the Stewart Manufacturing Co., Waterloo, Iowa.

George E. Carlin, Hammond, Ind., formerly with the Champion Corp. and the United Boiler Heating & Foundry Co., both of Hammond, has been made general superintendent of the Globe Malleable Iron & Steel Co., Syracuse, N. Y.

J. H. Kuster, chief engineer and foundry superintendent, Deutz Motor Works, Cologne, Germany, is at the present time visiting the different industrial regions of the United States in the interest of his principals. The Deutz Co. has the largest gasoline engine and cylinder foundry in Germany.

J. J. Newhardt formerly general superintendent of the National Motor Casting Co., South Haven, Mich., is at the present time foreman of the gray iron and electric steel foundries of the Standard Brake Shoe & Foundry Co., Pine Bluff, Ark. Mr. Newhardt at one time was works manager of the Michigan City Foundry & Machine Co., Michigan City, Ind.

Irvin E. McGowan has been made metallurgist and chief chemist for the Sparta Foundry Co., Sparta, Mich., manufacturer of individually cast piston rings. Mr. McGowan has been engaged in metallurgical work for the past 17 years, ten of which were spent in the blast furnace industry. Recently he was connected with the Piston Ring Co., Muskegon, Mich., in charge of the metallurgical department and laboratory.

Linwood D. Latta has been appointed secretary and treasurer of the Wayne Agricultural Works, Inc., Goldsboro, N. C., founder and manufacturer of plows and plow castings, grate bars, etc. Mr. Latta formerly was secretary of the N. Jacobi Hardware Co., Wilmington, N. C. D. W. Davis is president of the Wayne works.

Walter N. Crafts, who recently became associated with the American Chain Co., as works manager of the Reading Steel Casting Co., Reading, Pa., previously had been with the Canadian Electric Steel Co., Ltd., Montreal, Que., for the past five years being general manager of the latter company. During the war Mr. Crafts was general superintendent of the Toronto plant of the British Forgings, Ltd., the largest producer of electric furnace steel for shells at the time. Mr. Crafts some time ago developed a type of electric furnace for steel making purposes.

Foundry Index for 1924 Now Complete

THE complete listing of all articles published during 1924 with cross references and an authors index has been prepared and is ready for distribution. The index will be sent free upon request to any subscriber who requests a copy through the circulation department of THE FOUNDRY, *Penton building, Cleveland.*

Of the total value of textile machinery products reported for 1923, $35,036,652 was contributed by fiber to-fabric machinery (pickers, carders, rovers, spinners, winders, etc.) $30,402,137 by fabric machinery (looms, knitting and braiding machines, etc.), $10,276,721 by machinery for converting and finishing yarn and fabric (bleaching, dyeing, printing, mercerizing, finishing, etc.) $50,450,815 by other textile machinery, including extra parts, attachments, and accessories; and the remaining $14,495,033 represents the value of repair work and contract work done for others and of miscellaneous products other than textile machinery.

Iron Inserts Coated To Prevent Dampness

Question: Can you tell us how long it has been customary in the foundry to coat an iron or steel insert with some form of heat resisting material to prevent it from burning when molten iron is poured around it? For example, we contemplate placing a tapped nut in the mold for an iron block with the object of later eliminating the necessity of drilling and tapping a hole in the block itself. We should like to know if this is considered ordinary practice and about the approximate time it first was introduced in the foundry. Can you refer us to any recognized work on foundry practice where the use of silica flour, oil, soapstone or red lead is described for the purpose outlined?

Answer: The use of protective coatings on metal inserts has been practiced probably since the inception of the art of founding in metals. For all practical purposes it may be sufficient to refer you to *American Foundry Practice*, by Thomas D. West, first published in 1882. Mr. West discusses the subject in two chapters, one devoted to chaplets and the other to split wheels. Protective coatings are employed for two purposes, in the first they prevent the metal from adhering to the insert and in the second they promote adherence of the metal to the insert. From the fact that you group materials employed for these diametrically opposed purposes under the one heading we are inclined to the opinion that you have been misinformed on the subject. Silica flour, soapstone, and graphite are refractory materials and are employed in cases where the object is to prevent the molten metal from fusing the surface of the insert. If the shape is suitable and if necessary the insert may be removed after the casting is poured. A familiar example of this practice may be observed where metal

cores and interior chills are employed.

Red lead belongs to an entirely different group which includes oil, tar, asphaltum, shellac, chalk, water glass, and tin. Members of this group are employed as protective coatings to prevent the exposed surface of the insert from oxidizing under the influence of the atmosphere or from becoming damp from condensation of moisture in the mold. They are used on chaplets and other foreign bodies where a close and intimate union is required between the molten metal and the chaplet stem or whatever form the insert may present. A steel nut placed in an ordinary mold requires no refractory coating to prevent the metal from melting it. In fact unless it is coated with a material that promotes fusion, it eventually will work loose in the casting and unless held in place mechanically, will fall out. The only material you require for a coating is red lead or any other member of the group listed, to prevent the molten iron from *blowing* off the insert. If the nuts are thoroughly cleaned, sandblasted, tumbled, ground or heated to a red heat to remove the scale, they may be placed in the mold without any protective coating.

Tells Bronze Troubles

THE London branch of the Institute of British Foundrymen held a joint meeting with the Institute of Metals on the evening of Dec. 11 at the Institute of Marine Engineers in London, Vincent C. Faulker presiding. F. W. Rowe, Huddersfield, Yorks., read a paper on "Present Problems in Engineering Bronze Foundry Practice."

The author pointed out that although research work has been done and still is under way covering most of the nonferrous alloys, comparatively little contribution has been made on phosphor bronze manganese bronze and gunmetal. Passing on to the practice of bronze founding, Mr. Rowe showed a table indicating the thermo-efficiency of the various furnaces used, the lowest efficiency being about 8 per cent for crucible pit-fire furnaces and the highest being 85 per cent for the larger electric furnaces, cupolas and reverberatory furnaces giving an efficiency of from 20 to 40 per cent. It was pointed out that in American practice electric furnaces are extensively used, but British foundries are handicapped by the high cost of electric power in England.

He laid stress on the danger of oxidizing during melting operations and the necessity of detecting the oxide in castings. Many foundries use the best selected copper which always contains a certain quantity of oxide which sometimes can run as high as 2 and even 3 per cent. He also stated that the practice of adding from 30 to 40 per cent scrap in the charge is not conducive to eliminating oxidizing conditions and that the presence of phosphorus is not sufficient to prevent oxidation taking place. He said that particularly in the high tin bronze it is most difficult to get rid of the oxide.

The importance of casting temperature and rate of cooling was emphasized and in this respect Mr. Rowe said that in most of the British foundries he had noted that the use of pyrometers appeared to be general. According to the author the average melting temperature for bronze castings should be around 1100 degrees Cent. He said that in order to obtain homogeneous castings it is necessary to consider the freezing points of the various constituents, especially in high tin bronze. It was pointed out that the study of casting temperatures and rates of cooling constitutes an unlimited field of research.

The author said that by considering the color of the fracture of a casting an idea could be obtained of the temperature at which it had been poured. When the fracture is of a golden-brown color, this indicates that the pouring has been done at a high temperature, whereas a white fracture indicates a low casting temperature. Alluding to the metal separation known as tin sweat, the author said that the composition of exuded metal varies with that of the bronze. He stated that in most cases this defect is due to a too high casting temperature and that the remedy usually is to lower the temperature of casting, and if that is not possible to use larger runners. He also stated that the blow-holes generally are due to a too low temperature of casting.

Mr. Rowe pointed out the difficulty encountered in casting manganese bronze, owing to the shrinkage. This, he said, also is experienced with aluminum bronze casting. Practically no sand castings of aluminum bronze are made in Great Britain, the main obstacle being the difficulty of preventing oxidation. However, the author said that aluminum bronze is used for making permanent mold castings. Castings in aluminum bronze weighing as much as 1800 pounds are being made in America.

The Birmingham, Ala., office of the Dings Magnetic Separator Co., Milwaukee, has been removed to 513 N. Twenty-first street. H. M. Gassman is the Birmingham representative.

Automobile Foundryman Dies in South Bend

James J. Armour, foundry superintendent Studebaker Corp., South Bend, Ind., since Feb. 1914, died in his home in that city Dec. 2 at the comparatively early age of 48. Mr. Armour suffered a breakdown about a year ago and although he remained in active charge of the foundry until the end, he never regained the buoyancy, energy and state of physical well being which had earned for him the friendly title of Big Jim. He was active in community work, a director of the Red Cross and affiliated wtih several organizations of a like character. He organized the Foundry Good Will Club a benevolent and social organization among the foundry employes and served as president since its inception. In addition to providing sick and death benefits the club has been an important factor in developing a shop morale of a high order.

Mr. Armour was born in Oshawa, Ont., Jan. 25, 1877, and commenced his foundry career as a wire boy in a coreroom at the age of 14. Later he entered the employ of the Walkerville Malleable Iron Co., Walkerville, Ont., where he was advanced to the positions of foreman, and remained in that capacity for 2 years. He served for varying periods of time as foreman of the Lancester Foundry, Lancaster, N. Y.; the Standard Foundry, Detroit, and the Flanders Co., Pontiac, Mich., before he first joined the Studebaker Co., in Detroit as trouble man In 1914 he was promoted to the position of foundry superintendent in the South Bend plant of the corporation. He was active in the design and construction of the immense new foundry recently placed in operation and by peculiar coincidence was buried on the day the last small heat was poured in the old foundry prior to its actual abandoment.

Death of Denny Egan

D. F. Egan, affectionately known as 'Denny," died on Dec. 31. For 30 years he was New England representative of the Henry Pridmore Co., molding machine manufacturer, Chicago. His headquarters were in Boston. Mr. Egan was well and widely known to the foundrymen throughout the New England states and his knowledge of molding machine practice ever made him a welcome visitor in shops throughout his sales district.

Funeral services were conducted by the Elks, and his remains were interred at Lowell, Mass.

Anticipate Increased Buying

Manufacturers Believe Pickup in Foundry Equipment Sales Will Grow—Volume of Business in December Good Although Last Half Witnessed Lull—Demand Is Diversfied

PROSPECTS for a steady increase in the volume of sales in the foundry equipment market brightened during the first half of the month as the lull in business experienced during the latter part of December, due to the holiday season and inventory period, gradually is disappearing. Manufacturers are optimistic over the future of the market as steady increases are noted in the volume of inquiries being brought out as foundries continue to operate at increased capacities. Several plant additions are being planned which may necessitate equipment purchases in the near future, among which are the Nash Motors Co., Kenosha, Wis., Weil-McLain, Michigan City, Ind., and the Kedzie Foundry Co., Chicago. The Herman Pneumatic Machine Co., Zelienople, Pa., experienced the best December in the history of the company and has many inquiries for molding machines on hand. Sales of sand mixing machinery are reported by the National Engineering Co., Chicago, shakeout equipment by the Stoney Foundry Engineering & Equipment Co., Cleveland, sand-blast equipment by the Pangborn Corp., Hagerstown, Md., and core ovens by the F. A. Coleman Co., Cleveland.

Inquiries Out for Molding Machines

IN THE closing days of 1924 and early in 1925 sales of foundry equipment were only fair. In numerous foundries, inventories were taken and this in a way delayed the placing of equipment orders. However, prospects are exceedingly bright and before the first of February numerous orders undoubtedly will come through. The Patterson Foundry & Machinery Co., East Liverpool, O., has put out a list for ladles, core oven, etc. The Railway Industrial Engineering Co., Greensburg, Pa., has bought flasks and the Ricks Mfg. & Supply Co., Uniontown, Pa., also will buy flasks and replace other foundry equipment damaged recently in a fire. It now has an inquiry out for a 2-ton monorail hoist. The National Cash Register Co., Dayton, O., wants a special hoist. The Westinghouse Electric & Mfg. Co., East Pittsburgh, has issued its regular first quarter list but because so many small items are included it involves only an expenditure of approximately $50,000. The Herman Pneumatic Machine Co., Zelienople, Pa., reports that inquiries before it total at least 100 molding machines and that while December and January usually are dull months, this year the exact opposite is true. Last month was the best December of its history and from the outlook this month will probably prove to be the best January. Its sales recently include two more molding machines to the Michigan Steel Castings Co., Detroit, and one each to the following: Foster-Armstrong Co. division, American Piano Co., Rochester, N. Y.; Weil-McLain Co., Michigan City, Ind.; Commercial Steel Casting Co., Marion, O.; Kennedy Valve Mfg. Co., Elmira, N. Y.; De Lon Corp., Balston Spa, Pa.; Damascus Steel Casting Co., Hammond, Ind.; American Radiator Co., Buffalo, N. Y.; Franklin Valveless Engine Co., Franklin, Pa.; Michigan Valve & Foundry Co., Detroit; and the Arkansas Foundry Co., Little Rock, Ark Recent crane sales have been few although a number are pending. The Allegheny Steel Co., Brackenridge, Pa., bought a 15-ton crane with 75-foot span from the Shaw Electric Crane Works. The American Car & Foundry Co., Berwick, Pa., awarded a 10-ton electric crane with 35-foot span to the Pawling & Harnischfeger Co., Milwaukee. The Reliance Steel Casting Co., Pittsburgh, has secured sandblast and dust arrester equipment from the Pangborn Corp., Hagerstown, Md.

Cleveland Outlook Good

THE tone of the foundry equipment market in the Cleveland territory is strengthening. Inquiries are being brought out with every indication of an early closing on many of the lists. The demand is diversified covering practically all lines of the foundry equipment field. Manufacturers are optimistic over the outlook, feeling that the steady increase in operating capacity of foundries throughout the country will be reflected in further betterment in the volume of equipment sales. Repair business continues at a good rate. Sandblast equipment has been purchased by the Light Alloys Co., Painesville, O., and the American Seeding Machine Co., Springfield, O., from the Pangborn Corp., Hagerstown, Md. The Stoney Foundry Engineering & Equipment Co., Cleveland, has sold shakeout bails to the American Car & Foundry Co. for installation at the Madison, Ill., plant; the New York Air Brake Co., Watertown, N. Y.; vibrator and shakeout equipment to the Emerson-Brantingham Co., Rockford, Ill.; the International Motor Co., New Brunswick, N. J.; the Westinghouse Air Brake Co., Wilmerding, Pa.; the American Radiator Co., Buffalo; the Grabler Mfg. Co., Cleveland; the Hagan Foundry Corp., Orrville, O.; the Griffin Wheel Co., Kansas City, Kans.; and the Pullman Car & Mfg. Co., Pullman, Ill. The Vulcan Mold & Iron Co., Latrobe, Pa., has ordered three large type core and mold ovens for ingot molds from the F. A. Coleman Co., Cleveland. Other inquiries for ovens are pending.

Eastern Market Improves

INVENTORY season left its print on business in the eastern foundry equipment market during the past two weeks. While the past few days have registered some improvement, the period as a whole has been listless, with a number of foundries closed down almost completely. However, some that have completed their inventories, are now operating on a substantially better scale than before, indicating that orders during the interum were heavier. Sellers of equipment are more optimistic than in some time, and look for the next two weeks to bring about a decided gain. Current trading is comprised chiefly of scattered replacement orders. Nevertheless, the volume of inquiry appears to bear out the more cheerful sentiment prevailing. Included in prospective buyers is the recently incorporated New Jersey Brass Foundry Co., Newark, N. J., which has

leased a plant for which some new equipment will be required. New foundry projects, however, are scarce with those contemplated slow in getting under way. The Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., a recent purchaser of equipment, is inquirying for used electrical machinery. Sand cutters and sand blast equipment, according to one large seller, are moving better than any of his other lines at the moment in this district.

New England Sales Better

SALES of equipment have been slow in New England since Jan. 1, but definite signs of foundry improvement have developed and demand for foundry supplies is urgent. One dealer reports flask sales since the first of the year at fully double the rate of any similar period in 1924. A Connecticut foundry is in the market for sandblast apparatus and considerable other equipment in connection with a plant extension. The New London Ship & Engine Co., Groton, Conn., is in the market for equipment. The General Electric Co., Lynn, Mass., reports decided improvement in foundry activity and buying of compressors and pneumatic chippers is in process. Gilbert & Barker Mfg. Co., Springfield, Mass., is another active prospect as an equipment buyer. This concern has already purchased two molding machines.

West Sees Revival

CHICAGO district manufacturers of foundry equipment experienced a decided letdown in both inquiries and orders in the last half of December but they are not discouraged over the outlook. January is expected to reveal quite an improvement. The Weil-McLain Co. has just awarded the structural steel for its foundry extension at Michigan City, Ind., to the American Bridge Co., Ambridge, Pa. The Nash Motors Co. has placed the contract for foundry enlargements at Kenosha, Wis., with the Worden-Allen Co., Chicago. The Kedzie Foundry Co., Chicago, has awarded the general contract for a 1-story addition, 40 x 200 feet. The National Engineering Co. has sold sand mixers to the Pullman Car & Mfg. Corp. for its Michigan City, Ind., works, the Frazer & Jones Co., Syracuse, N. Y., and the Muncie Malleable Foundry Co., Muncie, Ind. The Pangborn Corp., Hagerstown, Md., has sold sandblast equipment to the Maynard Electric Steel Castings Co., Milwaukee; the Murray Co., Dallas, Tex.; and the Continental Gin Co., Birmingham, Ala.

What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

Republic Boiler & Radiator Co., Baltimore, Md., contemplates constructing a 1-story plant on Union avenue. The company operates a gray iron foundry.

Alabama Stove Works, Inc., Birmingham, Ala., has been formed with $50,000 capital, to manufacture and deal in stoves, by D. O. Dortsch, A. T. Stanley and others.

Union Pacific railway plans improvements and extensions to its shops and roundhouses at Nampa, Idaho, for which additional equipment and machinery will be needed.

Fox Foundry & Supply Corp., New York, has been incorporated with $5000 capital, by R. H. Law, J. Halliday and R. H. Law Jr., 251 Thirty-fourth street.

Nash Motors Co., Kenosha, Wis., is reported as contemplating purchase of foundry equipment in addition to the large volume of miscellaneous tools and machinery recently bought.

LaClede Steel Co., St. Louis, has transferred its forging plant at East St. Louis, Ill., to a new company to be known as the St. Louis Forgings Co., subsidiary of the Standard Forgings Co., Chicago.

Worthington Pump & Machinery Corp., New York, and 200 Devonshire street, Boston, has awarded contracts for constructing a 1-story, 80 x 165-foot foundry addition to its plant on East Third street, Cambridge, Mass.

Bessemer Gas Engine Co., Lincoln avenue, Grove City, Pa., contemplates the construction of a plant in the spring. J. Carrothers, is president of the company which operates a gray iron and aluminum foundry.

Sargent-Howard-Latourelle, Ltd., Montreal, Que., has been incorporated to carry on business of foundry and metalworking, with $50,000 capital, by Charles B. Howard, Sherbrooke, Que.; Grover S. Sargent and T. Latourelle.

Reading Knob Works, Reading, Pa., operator of gray iron, brass and aluminum foundries, has plans for constructing a 3-story, 30 x 200-foot plant addition for which Claude B. Mengel, 1122 Penn boulevard, Wyomissing, Pa., is architect. Charles L. Heizmann is president.

Fargo Marble & Granite Works, Fargo, N. D., plans constructing 2-story, 100 x 100-foot foundry and office building. J. E. Rosatti, 117 Broadway, is architect. G. Garufel, 201 Northern Pacific avenue, is president of the Fargo company.

Bunting Brass & Bronze Co., 715 Spencer street, Toledo, O., has retained Mills, Rhines, Bellman & Nordhoff, 1234 Ohio building, as architects for a plant to be constructed shortly. J. W. Bunting is president of the Bunting Company.

Kedzie Foundry Co., 3234 West Thirty-first street, Chicago, has awarded general contracts to A. E. Bjork, 133 West Washington street, for a 1-story, 40 x 200-foot brick and corrugated iron foundry building at 3234 West Thirty-first street. A. E. Bjork also is architect.

The Berryhill Malleable Iron Co., 1215 Powell street, Evansville, Ind., has retained J. Berryhill, as architect and engineer for a 1-story, 120 x 240-foot structural steel plant building. John Berryhill is president of the company. *Noted Jan.* 1.

The Archer Radiator & Furnace, Ltd., Toronto, Ont., has been incorporated with $200,000 capital, to manufacture and deal in furnaces, radiators, stoves, and other heating appliances, by Newton C. Shaver, David J. Archer and Francis A. Ogletree.

Maynard Electric Steel Casting Co., Twenty-second avenue and Kilbourn road, Milwaukee, recently has completed enlargements to its plants which has increased its capacity 100 per cent. The new space will be ready for occupancy Feb. 1.

New Method Stove Co., Mansfield, O., has has been incorporated with $325,000 preferred and 3250 shares no par value common stock, to manufacture and deal in stoves and other heating appliances, by H. H. Sanford, B. R. Ahrendt, E. D. Baxter, George A. Hoffman and Henry B. Sanford.

Crane Co., 836 South Michigan avenue, Chicago, manufacturer of valves and operator of various foundries, has retained Melvin L. King, Snow building, Syracuse, N. Y., as architect for a 1 and 2-story, 66 x 105 x 265-foot plant here. Kendall R. Ackerman, is Syracuse manager of the Crane company.

Grabler Mfg. Co., 6365 Broadway, Cleveland, has awarded contracts to Bolton Pratt Construction Co., 7113 Euclid building, for a 2-story, 30 x 60-foot cupola house. Christian, Schwarzenburg & Gaeda, 1900 Euclid avenue, are architects. L. Rosenfeld is president of the Grabler company which operates a malleable foundry.

The Fogg Bedstead Co., Westboro, Mass., manufacturer of iron and brass beds, has completed a new plant on Atlantic avenue, Boston, and has moved its machinery and equipment to the new location. The deserted plant at Westboro is understood to be for sale. This includes a modern foundry.

American Car & Foundry Co. is to spend $25,000 for new equipment in enlarging its plant at Milton, Pa. Offices of the company are at 165 Broadway, New York, and foundries are operated at Chicago, and Madison, Ill., Detroit, St. Charles and St. Louis, Mo., Buffalo, N. Y., Berwick, Pa., and Huntington, W. Va.

Hughes Tool Co., Houston, Tex., operator of a steel foundry and manufacturer of tools, has increased its capital stock from $300,000 to $2,000,000. The development program for 1925 includes the operation of a branch plant at Oklahoma City, Okla., now under construction, besides expansion of its other activities. Howard R. Hughes controls the company.

James B. Clow & Sons, Harrison and Franklin streets, Chicago, have retained Leonard Construction Co., 37 South Wabash avenue, Chicago, architects for a 4-story, 115 x 200-foot plant at Talman and Fulton streets. William E. Clow, 534 Franklin street, is president of the Clow organization which manu-

factures pipe and operates brass and aluminum foundries.

C. Hauber, 25 East Jackson boulevard, Chicago, is about to award contracts for a 1-story foundry, 50 x 60 feet, to cost about $10,000.

Railway Materials Co., 400 North Michigan boulevard, Chicago, operator of foundries at Phoenixville, Pa., Stevens Point, Wis., and Toledo, O., is reported as seeking an electric traveling crane for the Wisconsin plant.

McWane Cast Iron Pipe Co., 3600 North Eleventh avenue, Birmingham, Ala., is reported as planning extensions to its plant, including a new machine shop, extension of foundry capacity and new sand storage warehouse. Machinery and equipment of the old machine shop will be moved into the new structure but additional tools will be required for the enlarged capacity.

The Manchester Foundry Co., Ltd., Montreal, Que., has been incorporated with $100,000 capital to manufacture farm implements, machinery, metal goods, etc., and carry on general business of foundry operation, making gray iron, malleable and steel castings. Albert Forest, Arthur Lalonde, Montreal, and Jeane Emard, St. Lambert, Que., are incorporators.

Plans for the immediate establishment of a large plant to manufacture farm implements and do a general foundry and machine shop business, and to be located in suburban Atlanta, Ga., have been announced by J. T. Rose, president of the Atlanta Industrial Corp., which is to establish the plant. The new company has acquired properties of the defunct Oliver Rim Co. valued at $250,000, which it will improve. A. J. Yaretsky, for some years with the Atlanta Foundry & Machine Co., will be general manager of the Atlanta Industrial Corp.

Anderson Engine & Foundry Co., Anderson, Ind., is the new company which recently acquired the Anderson Foundry & Machine Co. which had been in receivership. Officers are E. W. Conney, president and general manager, formerly with the National Forge & Tool Co., Irvine, Pa.; and Bert McBride, treasurer, president of the Continental National bank, Indianapolis. Directors are F. C. Hesch, vice president Titusville Forge Co., Titusville, Pa.; I. L. May, president May Supply Co., Anderson; J. E. Green, president Matthew Addy Co., Cincinnati; Luther F. Pence, Anderson and Emerson E. McGriff, Portland, Ind.

New Trade Publications

FURNACE LININGS—A special preparation for use in lining furnaces is described in a booklet of the Keystone Refractories Co., New York.

UNA-FLOW ENGINES—Advantages of a una-flow engine are discussed in a booklet recently published by the Mesta Machine Co., Pittsburgh.

FIRE BRICK—Tests by the Mellon Institute for Industrial Research, as applied to its refractory products are reproduced in a leaflet by the Ashland Fire Brick Co., Ashland, Ky.

SAND RIDDLE—A new pneumatic sand riddle is described in a folder put out by the Adams Co., Dubuque, Ia. In another folder of the same company, a jolt squeezer molding machine is described and illustrated.

RESISTORS—A well illustrated booklet of 18 pages by the General Electric Co., Schenectady, N. Y., presents the company's line of enameled resistors and their advantages in railway signal work and other uses.

DUST ARRESTERS—Among other information given in a bulletin on dust arresters, the American Foundry Equipment Co., New York, has included a table of knock-down dust arresters.

CORE KNOCKOUT MACHINE—The Stoney Foundry Engineering & Equipment Co., Cleveland, has published a folder describing a new shakeout bail, molding machine and core knockout machine.

DUST COLLECTORS—The J. W. Paxson Co., Philadelphia, has published a folder describing and illustrating the dust arrester of its manufacture. A number of the companies now using this type of equipment in connection with their plants also are listed.

STEAM ENGINES—Comparison of the una-flow steam engine with some other types as to consumption of steam and cost of fuel is given in a leaflet by the Mesta Machine Co. Pittsburgh. Indicator cards showing actual performance are given.

SAND-BLAST ACCESSORIES—Supplies and accessories necessary in the sand-blast room are listed in a pamphlet recently issued by the Pangborn Corp., Hagerstown, Md. The equipment listed includes nozzles, hose, gloves, hoods and helmets, respirators, aprons and abrasives.

INDUCTION MOTORS—The stator and field winding assmbly of its polyphase squirrel cage induction motor is illustrated in detail in a bulletin by the Century Electric Co., St. Louis. Every detail of the assembly is shown and described.

COMBUSTION EQUIPMENT—Major products of the Combustion Engineering Corp. New York as described in the 1924-25 volume of the A. S. M. E. condensed catalog of mechanical equipment are shown in a pamphlet issued by that company.

WELDING AND CUTTING EQUIPMENT—Information from its large catalog has been put into a booklet that may be enclosed with a letter by the Bastian-Blessing Co. Chicago. It is a compact presentation of the subject of welding and cutting by the use of gas.

FACTORIES—Frank D. Chase, Inc., Chicago, has published a folder showing reproductions of photographs of a number of plants and buildings built by this company. A partial list of companies, for whom buildings have been built, also is included.

RUST PREVENTION—A preparation for rust prevention is described in a booklet by the American Rust Proof Co., New York. A steel disk is pinned on the cover, one half of which was treated with the preparation before the disk was exposed to the weather. One half is rusted and the other half is not.

SAND HANDLING—The R. W. McIlvaine Co., Chicago, in a recent bulletin, tells of foundry sand handling service. Photographs show the installation of sand handling equipment manufactured by the McIlvaine company in several plants. Some of the features of this equipment are listed.

PYROMETERS—Instruments and service of the Brown Instrument Co. Philadelphia with the varied uses to which pyrometers may be put are described in a catalog just issued by that company. It is a condensed exposition of the value of accurate measurement of temperature in various industrial operations.

CLAMSHELL BUCKETS—An essential piece of apparatus in handling loose materials, the clamshell bucket is described in its varied uses and many applications in a booklet by the Brown Hoisting Machinery Co. Cleveland. Details of construction and data for choosing the best suited for a given purpose are presented.

ELECTRICAL HEATERS—Space heaters made by the Cutler-Hammer Co. Milwaukee, Wis., are featured in a six-page pamphlet. Their use in keeping vaults warm and dry, in negative drying cabinets, valve houses in fire sprinkler systems, watchmen's towers and crane cabs.

WELDING FLUX—A chemical compound fused at high temperature to insure complete solution of the elements is described in a pamphlet by the Chemical Treatment Co., New York. Its purpose is to furnish a flux for welding iron and steel which will produce a soft, ductile weld that can be machined readily.

TRANSMISSION MACHINERY—The W. A. Jones Foundry & Machine Co., Chicago, has issued two catalogs, one covering power transmission machinery and the other sprocket wheels and chain belting. Both are illustrated and contain engineering data of use to the machine shop engineer.

ELECTRIC CRANE EQUIPMENT—A bulletin by the General Electric Co., Schenectady, N. Y., discusses to some length the various electrical devices used on cranes. This includes motors and control, brakes and accessories. Information is given on operating characteristics and types of standard motors are listed, with much valuable data.

COAL METERS—A device for measuring the volume of coal passing to a combustion chamber is featured in a current bulletin by the Republic Flow Meters Co., Chicago. The meter is based on the fact that equal volumes of coal have equal weight, within narrow limits, regardless of the size of the pieces. Full description, engineering data and illustrations are supplied.

CIRCUIT BREAKERS—Two additions to its line of circuit breakers are described in a bulletin of the Roller-Smith Co., New York. One is a double pole interlocked trip breaker and the other a shock-proof attachment for use in special locations. A number of other pieces of electrical equipment also are shown in this bulletin.

SIDE-BLOW CONVERTER—The Whiting Corp., Harvey, Ill., has published a booklet discussing the side-blow converter and its relation to other processes. Information is given on the size of castings that may be poured with the converter of its manufacture, use for alloy steels, process, analysis of castings, and much other information. The work is well illustrated with views of a number of installations.

SURFACE AIR COOLER—A bulletin of 12 pages is used by the General Electric Co., Schenectady, N. Y., to present its surface cooler. The general construction, principles of operation and other features of the device are presented, with illustrations of actual installations. These coolers are used in closed systems of ventilation where air from the turbine-generator is recirculated to the machine after passing over the finned surface of tubes containing water as the cooling medium.

ARC WELDING AND CUTTING—A manual of 127 pages, bound in cloth has been issued by the General Electric Co., Schenectady, N. Y., describing arc welding and cutting equipment. It is issued to tell in a general way some of the applications of arc welding and to provide a simple and logical method by which one may acquire a certain familiarity with the manipulation of the electric welding arc and its characteristics. It is profusely illustrated with photographs, diagrams and charts. Of the three parts the first is devoted to general information on arc welding, the second to a training course for operators and the third to applications of arc welding. It is being distributed at a nominal price.

What The Industry Needs Today Is Sales Not Production

Self Starting Sales Ideas Never Overload Providence

WHEN our sage friend, P. T., wrote the remarks noted in the center of this page, he did not refer particularly to the only animal in his zoo that got a hump on himself. He merely emphasized one truth carried in two other ancient proverbs. One relates to locking the door after the horse is stolen, and the other to the graciousness of the Almighty in lending a hand to anyone who is willing to strike out for himself.

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I WONDER sometimes if the modern foundryman hasn't lost the padlock off the stable, and if he isn't unloading entirely too much responsibility on the Creator in looking after his private affairs.

P. T. Barnum wrote these lines about the time when the William Tell tie was worn by the man who was considered well dressed. You remember the tie, fastened to an elastic that went around the collar under the hinged back button. William Tell? Sure, pull the bow and hit the apple. That was the era of the cast-iron dog on the front lawn, the cast-iron fence around the Judge's house, the splashing fountain with the two little cupids holding a cast-iron umbrella over their heads to ward off the descending shower; although with their scanty, cast-iron clothes, one wonders at their unwillingness to take a ducking. Of course, all of these things have been properly sneered at as mid-Victorian, but by the sizzling shade of Tubal Cain, they were durable.

P. T. Barnum Says/

MAHOMET, one night, while encamping in the desert, overheard one of his fatigued followers remark: "I will loose my camel, and trust it to God." "No, no, not so," said the prophet, "tie thy camel and trust it to God."

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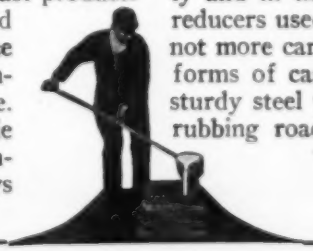
I WONDER if foundrymen have been negligent in not standing up for the merits of cast products against the inroads of drawn, forged and rolled materials. Corrosion resistance is only one of many factors that recommend castings for long time service. How seldom is this stressed. When tie plates were specified for one of the immense bridges carrying terminal railways entering St. Louis, malleable iron was chosen. This metal resists the corroding effect of brine dripping from refrigerator cars. Rolled plates which largely have superseded cast tie plates, could not stand the gaff. Similarly, a number of street railway lines have found that malleable tie plates alone will resist oxidation when laid in concrete. The malleable people saw the sales opportunity in this one factor of their product.



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CAN you remember only a few years ago when the wooden artillery-type wheel was the only kind available for automobile or truck use? Then the war came along and the cast-steel truck, tractor and gun carriage wheel came into its own. It made good and has maintained its place since that time for heavy duty. Then the disk-type, sheet-steel wheel was produced for passenger type automobiles, apparently without contest from the makers of cast wheels. We won't enter into the merits of the two types, but it is significant that one maker this year is equipping his better passenger models with a beautifully made, cast-steel wheel. The car in question can't be mentioned here, but the name is that which you apply to a red headed woman, when you speak of her hair, ***in her presence.*** Hats off to the foundryman who sold that manufacturer cast-steel wheels. He sure tied the camel.

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WOOD is *not* the most practical material for wheels. It is expensive, deteriorates rapidly and in these days with all the forms of bounce reducers used, resilience is not a factor. Why should not more cars use cast steel, cast aluminum or other forms of cast metal wheels. And wouldn't a good sturdy steel wheel take the starch out of those hub-rubbing road hogs?

Phineas, Jr